CANADIAN MACHINERY AND MANUFACTURING NEWS

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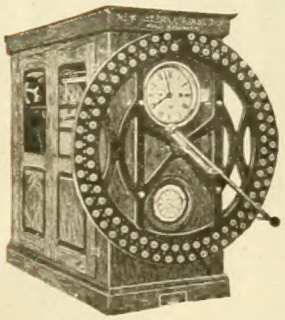
WHEREVER THERE IS A PAYROLL There Should be INTERNATIONALS

ACCURACY is the first requirement of timekeeping and payroll systems. The clearly printed records produced by International Time Recorders provide a reliable means of obtaining that accuracy.

Wherever there is a payroll there should be Internationals.

International Time Recorders



Are manufactured in electrically and spring driven models designed to meet every timekeeping and cost keeping requirement of any size and kind of business.

Through unfailing accuracy and fairness Internationals put the interests of both employer and employees on a basis of guaranteed protection and profitable harmony. May we tell you about the adaptability of Internationals to your specific needs?

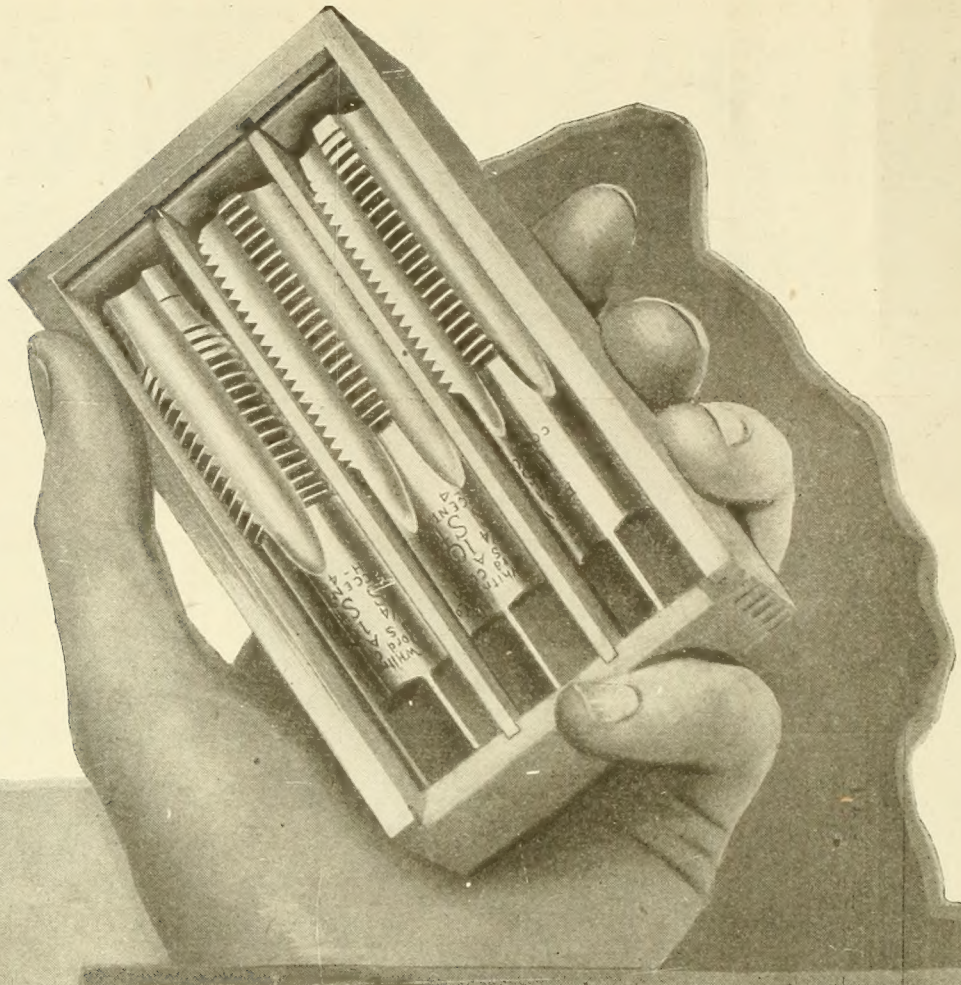
International Business Machines Company, Limited

F. E. MUTTON, Vice-President and General Manager

Head Office and Factory, 300-350 Campbell Avenue, Toronto

HALIFAX 44 Granville St.	*QUEBEC* 506 Merger Bldg.	*MONTREAL* 1-3 Notre Dame St. W.	*OTTAWA* 190 Queen St.	*TORONTO* 409½ Yonge St.
HAMILTON 228 King St. E.	*LONDON* 489 Richmond St.	*WALKERVILLE* 44 Lincoln Rd.	*WINNIPEG* 227 McDermott Ave.	*VANCOUVER* 110 Water St.

Also manufacturers of International Dayton Scales and International Electric Tabulators and Sorters



P & W

Pratt & Whitney Taps

"With the 'Con-eccentric' Land"

P & W Taps are **good** taps—easily the best where accuracy and high speed are essential. They cost more to buy, but less to use than others.

If you're doing work that calls for big production and for unusual precision, give them a trial. You'll be back for more when you see them prove themselves.

The "con-eccentric" land—the special feature of Pratt & Whitney Taps, permits sharpening on face of the cutting edge without affecting size. It lengthens life and assures accuracy hitherto thought impossible in a commercial tool.

PRATT & WHITNEY COMPANY OF CANADA, LIMITED

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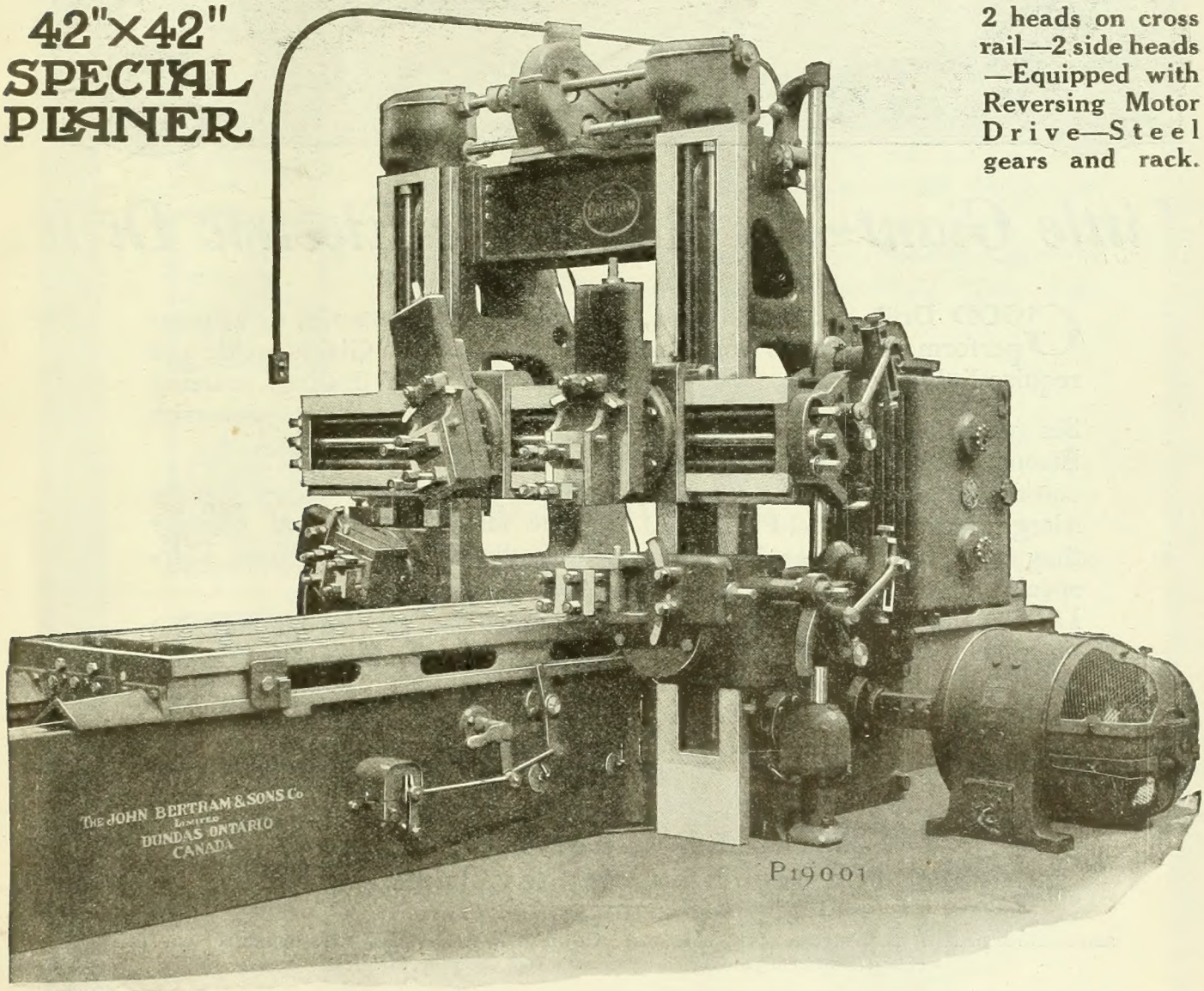
WINDSOR: Davis Building

The BERTRAM Page

MACHINE TOOLS

42"×42" SPECIAL PLANER

2 heads on cross rail—2 side heads —Equipped with Reversing Motor Drive—Steel gears and rack.



The John Bertram & Sons Co., Limited

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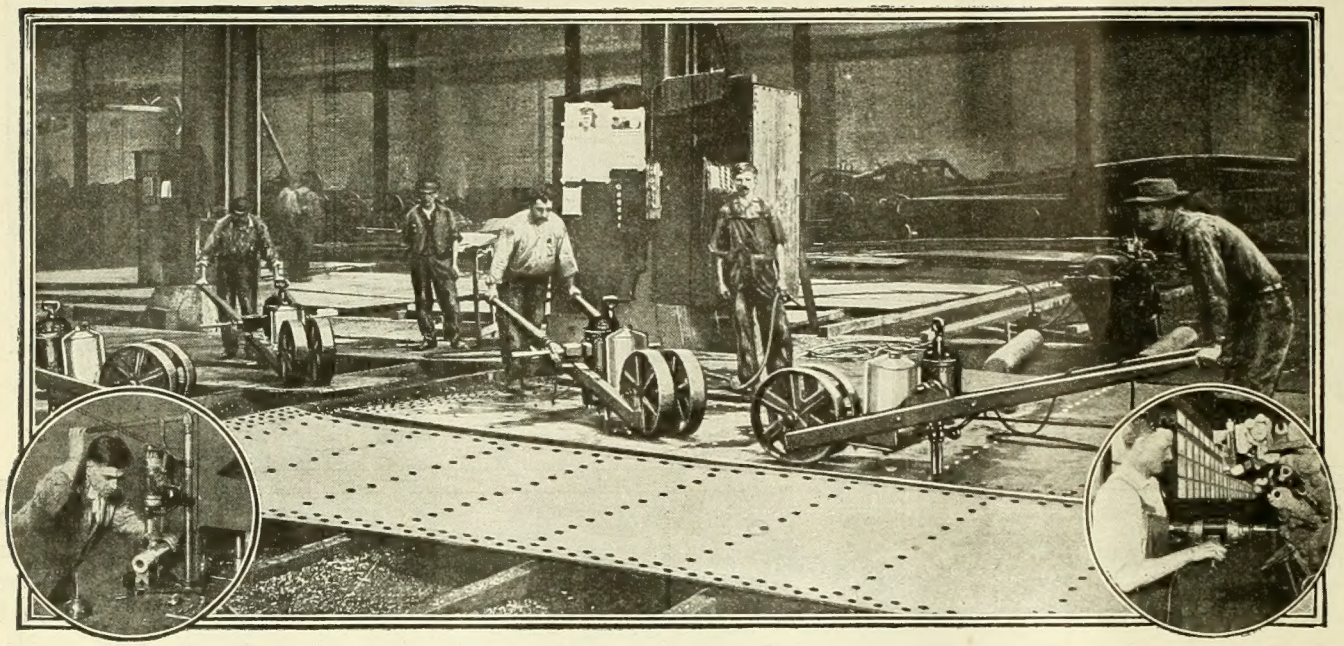

Little Giant—the Adaptable Electric Drill

GOOD Drills, like good men, perform dependable work and require little attention.

Six years ago the Little Giant Electric Drills illustrated, started cutting down production costs in a large Pittsburgh Steel Plant—and they are still hard at it! (The special buggies upon which these Little Giants are mounted, are not manufactured by this Company, but show the adaptability of Little Giant Electric Tools.)

Mounted on buggies, used in stationary drilling stands, or as portable tools, Little Giants tackle and finish scores of drilling, reaming and numerous other jobs with equal facility and dispatch.

What jobs in *your* shops can be done faster, better and cheaper with the aid of Little Giant Electric Tools?

Experienced service engineers at the nearest Company Branch will gladly submit recommendations based upon careful investigation.

Write for Electric Tool Booklet 397

Sales Representatives

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354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

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BOYER PNEUMATIC HAMMERS··LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
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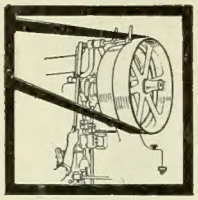
LITTLE *Electric* **GIANT** *Tools*

BELTING

For **Transmission**

SCANDINAVIA — FEDERAL ENGINEERING & SUPPLIES LIMITED — TORONTO — BELTING

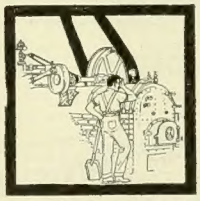
For **Conveying**



GOOD ON BELT SHIFTERS

GOOD IN OILY PLACES

GOOD IN DUSTY PLACES



GOOD IN HOT PLACES

For Conveying

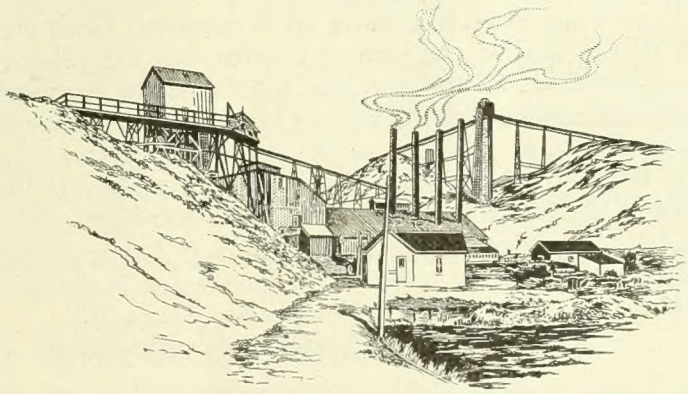
Use the regular Scandinavia Belt for conveying abrasive materials such as coal, rock, ore, coke, etc., and you will be surprised at the material it can handle per dollar cost.

For non-abrasive material use our special conveyor. This is especially adapted for handling clay, pulp, sawdust, sand, etc.

And the price is very reasonable.

For Transmission

The illustrations to the left indicate where this belt can be used to advantage. This belt makes a good general service belt.



Write Us Your Requirements

FEDERAL ENGINEERING CO., LIMITED

172 John St., Toronto

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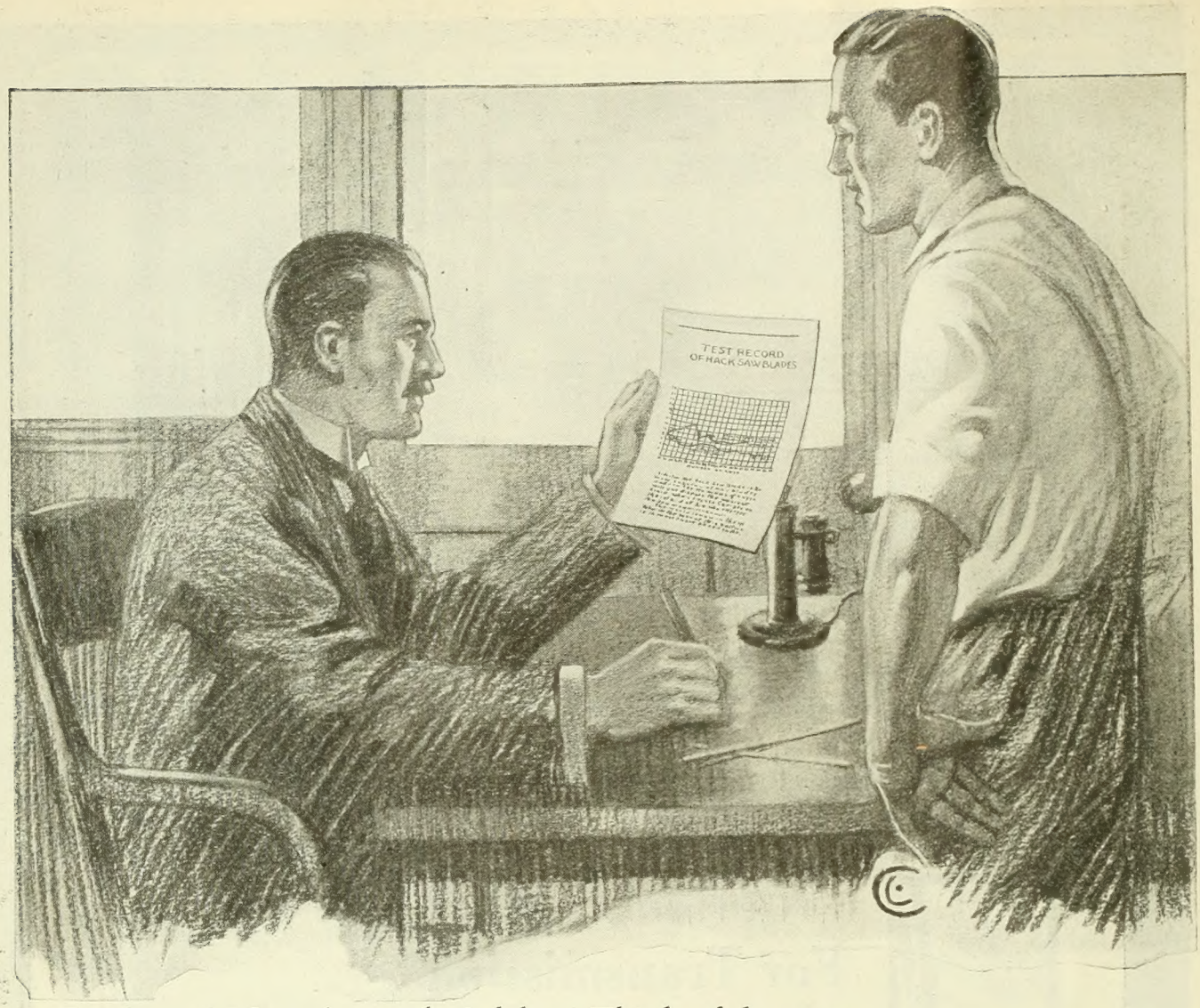


Ten hours! More than a day's labor! Think of the cost in dollars!

Such was the result of a test between the flexible type of hack saw and an all-hard blade.

Both were designed to cut the same material! Both were carefully run to deliver the utmost service, but the all-hard blade demonstrated from the start that it cut costs by cutting quicker. On power sawing, where weight is needed to make the teeth of a blade "bite" into the stock, the soft-back saw is not practical. Because of its flexibility, pressure makes it "buckle" Without this weight the cost per cut is too high.

For economical power sawing the proper blade for the particular kind of material to be cut is indicated by the Starrett Hacksaw Chart. It will be mailed to you, free. Ask for Catalog No. 22 "3."

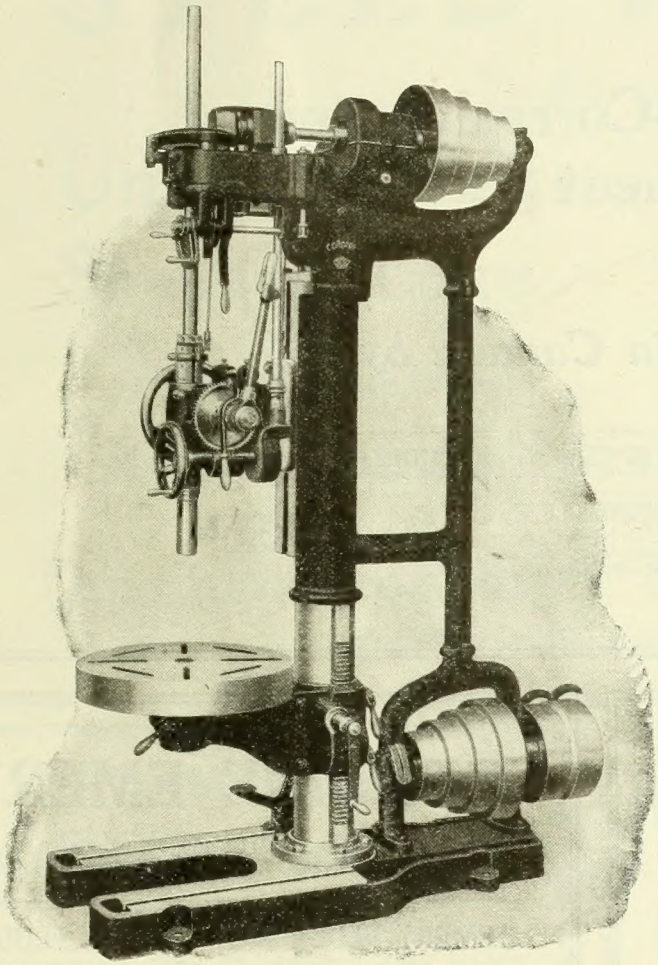
THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

ATHOL, MASS.

Use Starrett Hack Saws

DRILLING MACHINES IN STOCK



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We have a substantial stock of drilling machines which we offer for immediate delivery consisting of—

ALFRED HERBERT BALL-BEARING DRILLS, with one, two, three and four spindles, with plain or geared spindles and with or without our patent self - engaging, self - releasing automatic feed.

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12" Sensitive Bench Drills
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We supply not only drilling machines but also the equipment essential to the efficient running of the drilling department. Drill Grinding Machines, vices, standard and quick change drill chucks, twist drills, reamers, etc.—we can offer them all coupled with experience gained from our own drilling departments in which 200 machines are in constant operation.

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Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.

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Made in Canada by

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ELEVATING TRANSMITTING CONVEYING
BELTING

BELTING

That ensures a big measure of efficient and economical

SERVICE

We carry in stock Leviathan and Anaconda Belting, from 1" up, all plies, and are prepared to supply any length of belt at any time whether for conveying, elevating or transmission.

The belting comes in rolls of 500 ft., but we can supply any portion of this or one or more rolls at a moment's notice. Stocks carried at all points given in addresses below.

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Flint
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JOHN OAKEY & SONS
LIMITED
WELLINGTON MILLS
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WE CAN SUPPLY

STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness **Any Lengths**

Send Us Your Enquiries.

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We stock in Montreal Free Turning Brass and Bronze Rods, suitable for high speed Turning both in Round and Hexagon.

We shall also be pleased to quote for shipments direct from Birmingham, shipping in two weeks' time.

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We excel in quantity production

GREY IRON CASTINGS

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QUALITY!
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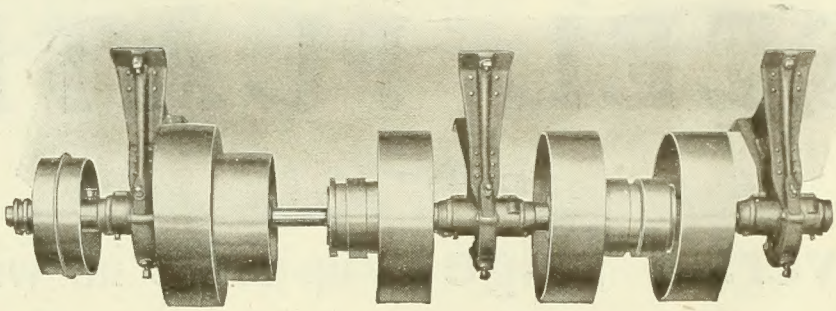
THE JOHNSON FRICTION CLUTCH



Put Johnson Clutches on Your Countershafts

Here's a countershaft equipped with three Johnson Clutches—two of the single type and one of the double—providing two speeds, a reverse and a light auxiliary drive. An exceptionally neat and compact construction is obtained, light in weight and smooth-running.

Wherever really high-grade equipment is desired, Johnson Clutches are the selection. For general transmission purposes there is no clutch more reliable, and none so adaptable to all conditions. Johnson Clutches in special types have also been incorporated successfully in machinery of all kinds. Their exceptional fitness for this line of work is described in our booklet, "Clutches as Applied to Machine Building."

Write for our Yellow Catalog.

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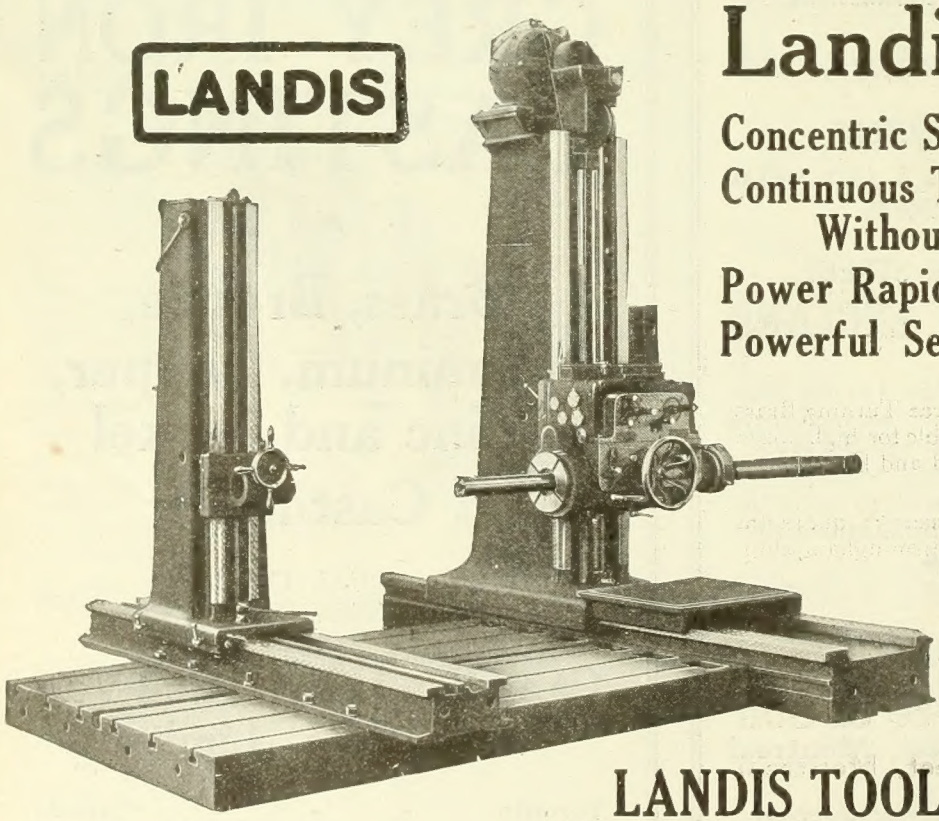
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

LANDIS



Landis Service

Concentric Screw Feed of Spindle
Continuous Travel of Spindle Without Resetting
Power Rapid Traverse
Powerful Self-Contained Drive

Features of Landis Horizontal Boring, Milling and Drilling Machine, which, combined, produce machines of the highest grade and will readily adapt themselves to your need for efficient service. Absolute accuracy is the characteristic of the Landis.

Our Catalog contains interesting information.

LANDIS TOOL CO., Waynesboro, Pa.

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If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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O. H. STEEL
- Bolsters
- Couplers
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- Machinery Castings
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- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersections

This list is merely an indication

General Offices:
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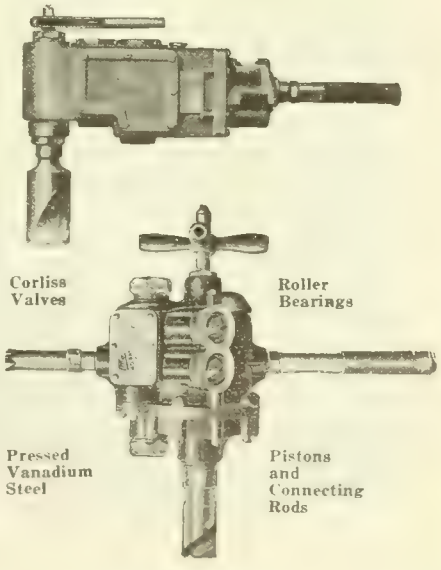
Pneumatic Tools in Which "First-Cost" Is Soon Saved in Fewer Repairs

All Pneumatic Tools are as strong as their weakest part. So in producing THOR tools we have been perhaps over-critical with our factory men on those small, yet important mechanisms which make up the finished tool. But we find the longer wear, the absence of time-losing breakdowns resulting from this extra care, is what has made THOR tools standard equipment in so many factories and shops to-day.

Take, for example, THOR Drills, with Corliss Valves, Pressed Vanadium Steel connecting rods and pistons, roller bearings, each minute detail of construction is ready to stand the severest strain which constant operation may place upon it. The result is THOR tools are many times worth their first cost.

Send for latest catalogue of THOR Tools for 1921.

Thor



INDEPENDENT PNEUMATIC TOOL COMPANY

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Springs *for* Every Use

We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for accuracy and quality. Send us specifications, for estimates.

THE DUNBAR BROS. CO.
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WHY NOT?

Why not Save Time, Grinding Wheels and High Speed Steel by using Armstrong Tool Holders on Your Lathes and Planers?

Refuse Imitations and Substitutes.

Catalogue free.

Armstrong Bros. Tool Co.
"The Tool Holder People"
335 N. Francisco Ave., Chicago, U.S.A.

Heat Under Accurate Control

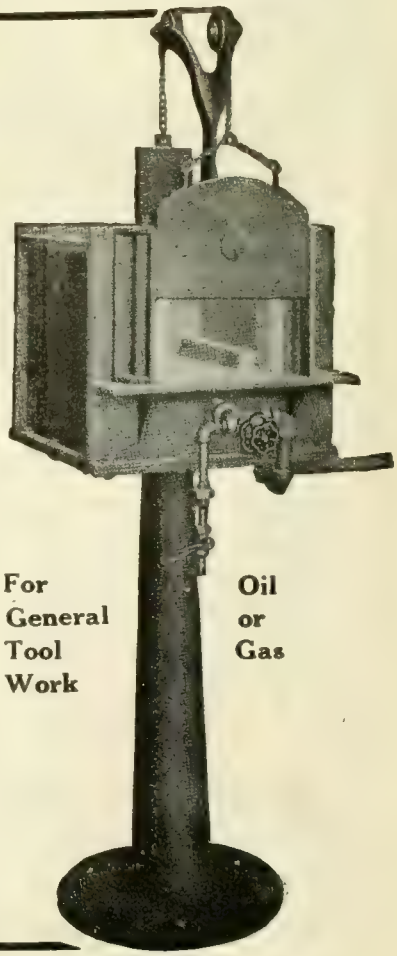
Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, are features that distinguish

BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

Let us advise you about your heat-treating problems



For General Tool Work

Oil or Gas

Bellevue Industrial Furnace Company

Julius C. Hinz, President

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Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada

Rotary Continuous Heat-Treating Furnaces
Used in Quantity Production of Pressed Steel Parts.

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The following advantages are secured by the Continuous Method of Heat-Treatment:

Bringing material up gradually to the final temperature.
Utilizing heat in spent gases to preheat material.
Exposing each piece to heat in same manner, to same temperature, for same length of time.
Uniformity not only of the individual piece but of the sections thereof as compared with the corresponding sections of other pieces.

DO THESE ADVANTAGES APPEAL TO YOU?

Write for Bulletin 217-T and learn whether the continuous method is adaptable to your product and manufacturing conditions.

W. S. ROCKWELL COMPANY
Furnace Engineers and Contractors
50 Church St. (Hudson Terminal Bldg.) New York
We make Industrial Heating Furnaces for Every Requirement
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STEEL CASTINGS

We shall be glad to supply, in addition to our General Catalogue, literature on

Steel Castings	Lithographed Ware
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Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

Castings supplied for shipbuilding, cars locomotives, all classes of machinery, etc

The Thos Davidson Mfg. Co Limited

Head Office: Montreal

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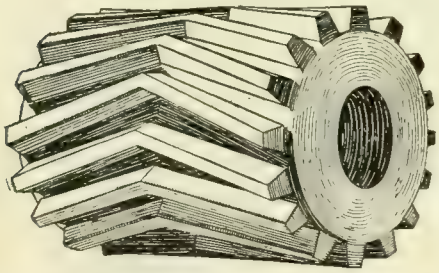

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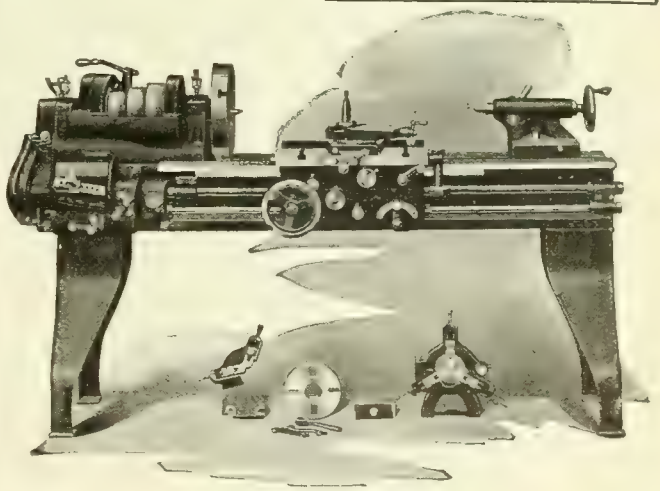
The Rockford "ECONOMY"

Small in Size Big in Production

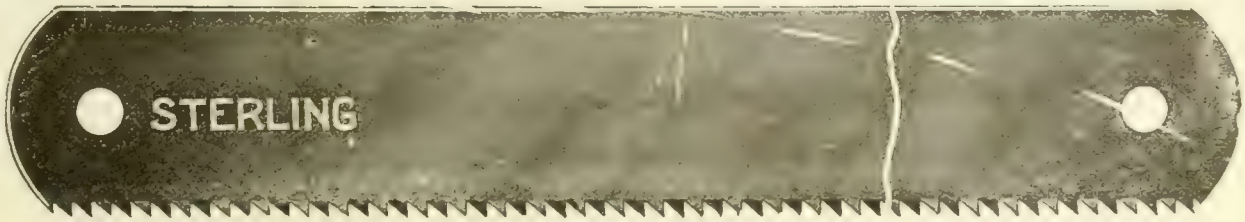
A small, powerful, Double Backed Geared, Quick Change Engine Lathe of extreme precision. Made in 14", 18" and 22" swing.

Write for full particulars without delay.



Rockford Lathe and Drill Co.
ROCKFORD, ILLINOIS, U.S.A.

HACK "STERLING" SAWS



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DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.

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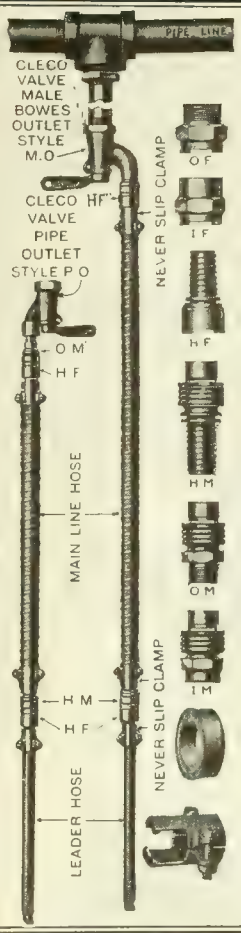

Cleco Pressure-Seated Air Valves

Bowes Air Hose Couplings—Cleco Never Slip Hose Clamps and Cleco Grooved Hose Nipples and Hose Clamp Tool

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

STYLE I.F. is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ¼-inch to 1½-inch.

STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-inch to 1½-inch.

The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-inch.

CLECO VALVES

Style P.O. Style M.O. Style A.

Style P.O.—Made in sizes ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet, Connects with Bowes sizes ¼ in. to ¾ in.

CLECO GROOVED HOSE NIPPLES

Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

The Lightening Hose Clamp Tool illustrated applies wire clamps at a cost of 1½ cents each.

In stock: Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

Use Annealed Wire No. 14

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.

Bulletins Nos. 43, 44, 46 and 47 mailed on request.

THE MODEL HOSE LINE illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

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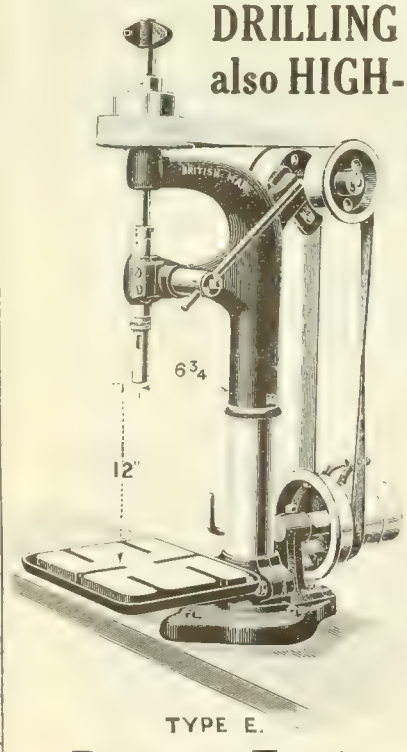

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TEN DIFFERENT TYPES, ALL FROM STOCK

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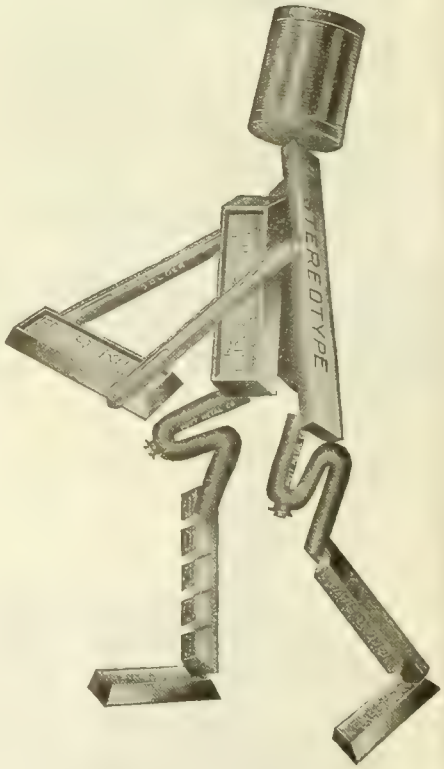
will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.



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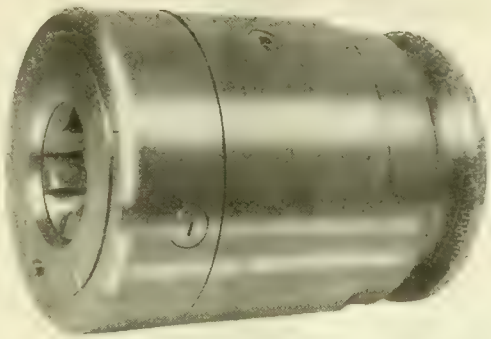

TYPE "R"

HARTNESS AUTOMATIC DIES

FOR REVOLVING SPINDLES

The No. 4 Type R Hartness Automatic Die has been designed for use on revolving spindles, either Vertical or Horizontal.

THREE TYPES OF CONTROLS

Outside button coming into contact with some set stop on the machine.

Regular knock-off by carriage coming to a stop while chasers, which are carried along by the revolving thread, pull the body away from the latch pin.

Sleeve control enable chasers to be released or locked at any time.

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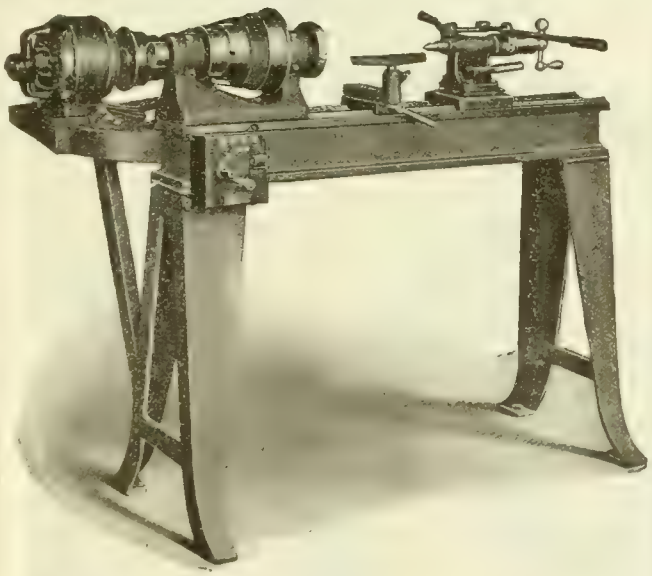

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This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

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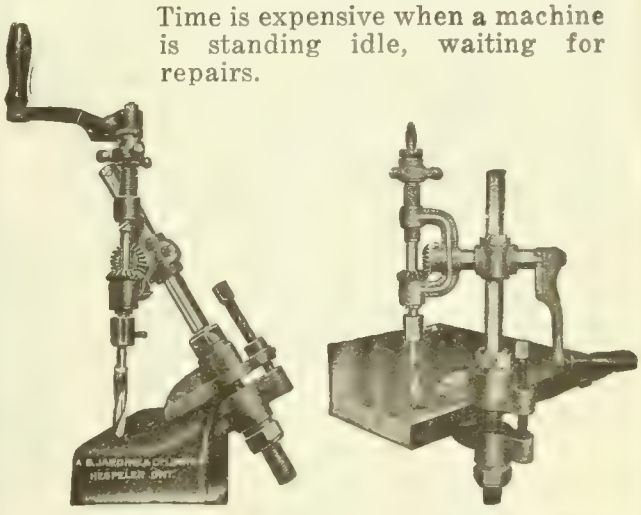
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses.

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Screw machine product up to 2¼" diameter to customers' specifications. Hardened and ground product to specifications.

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V., U.S.S., and S.A.E. Cap Screws
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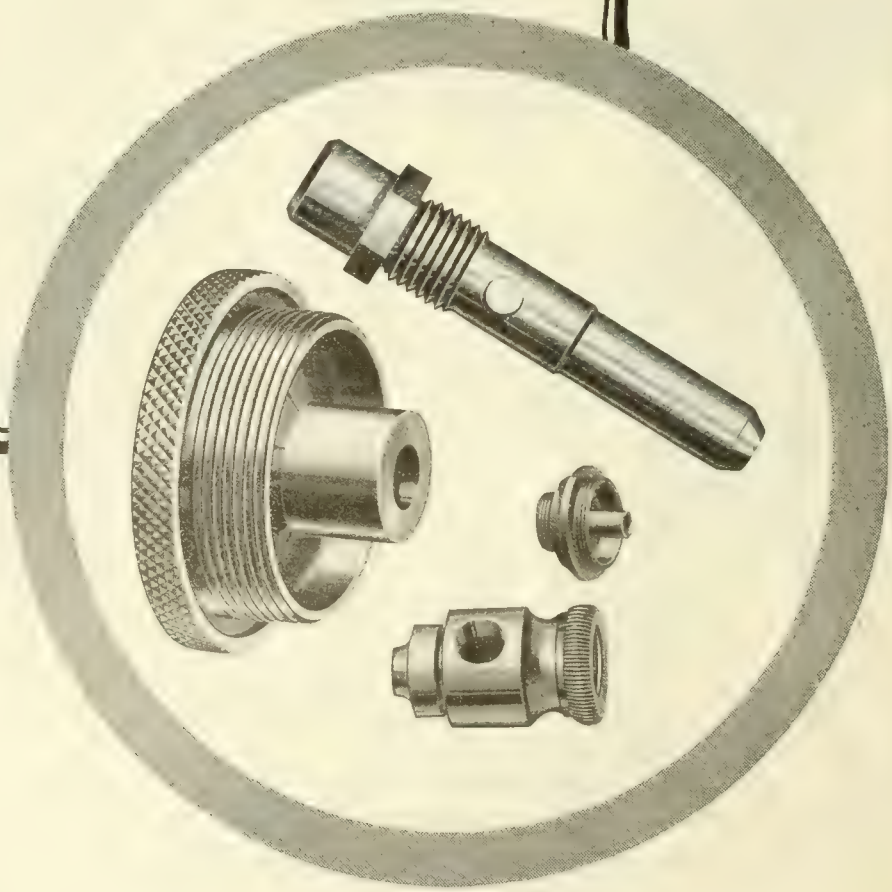

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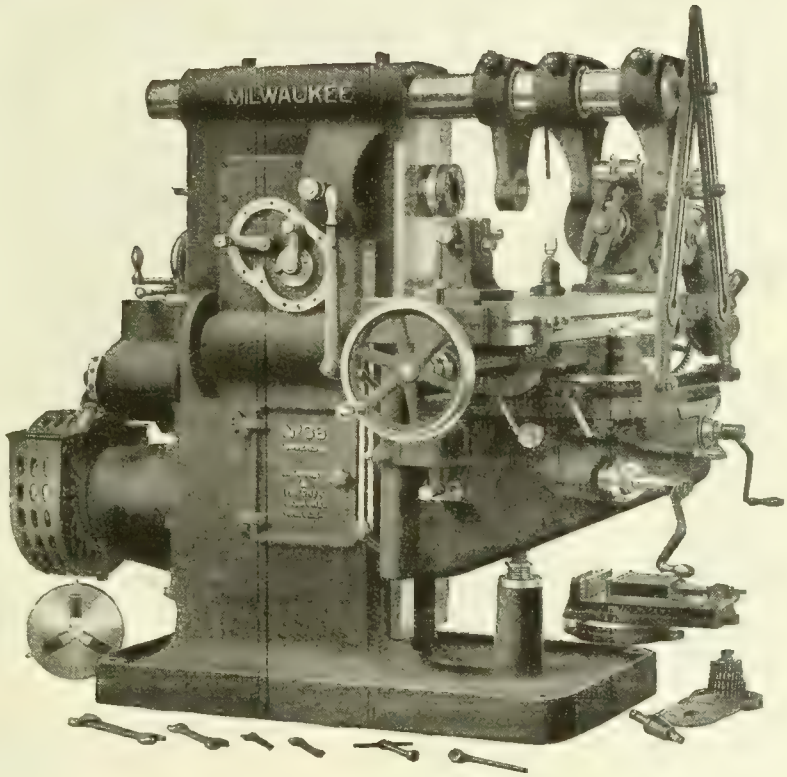

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Superior Service in the Tool-Room

MILWAUKEE Universal Milling Machines are accurate, rigid and flexible and are distinguished for their efficiency on all kinds of milling done in the tool-room. Light or heavy operations are as one to the "Milwaukee".

A really scientific construction with all parts of the machine properly proportioned so as to form practically a single unit; features to reduce supervision, maximize ease of operation and increase the accuracy, rigidity and entire efficiency of the machines, make Milwaukee Universal Milling Machines the choice for the tool-room.

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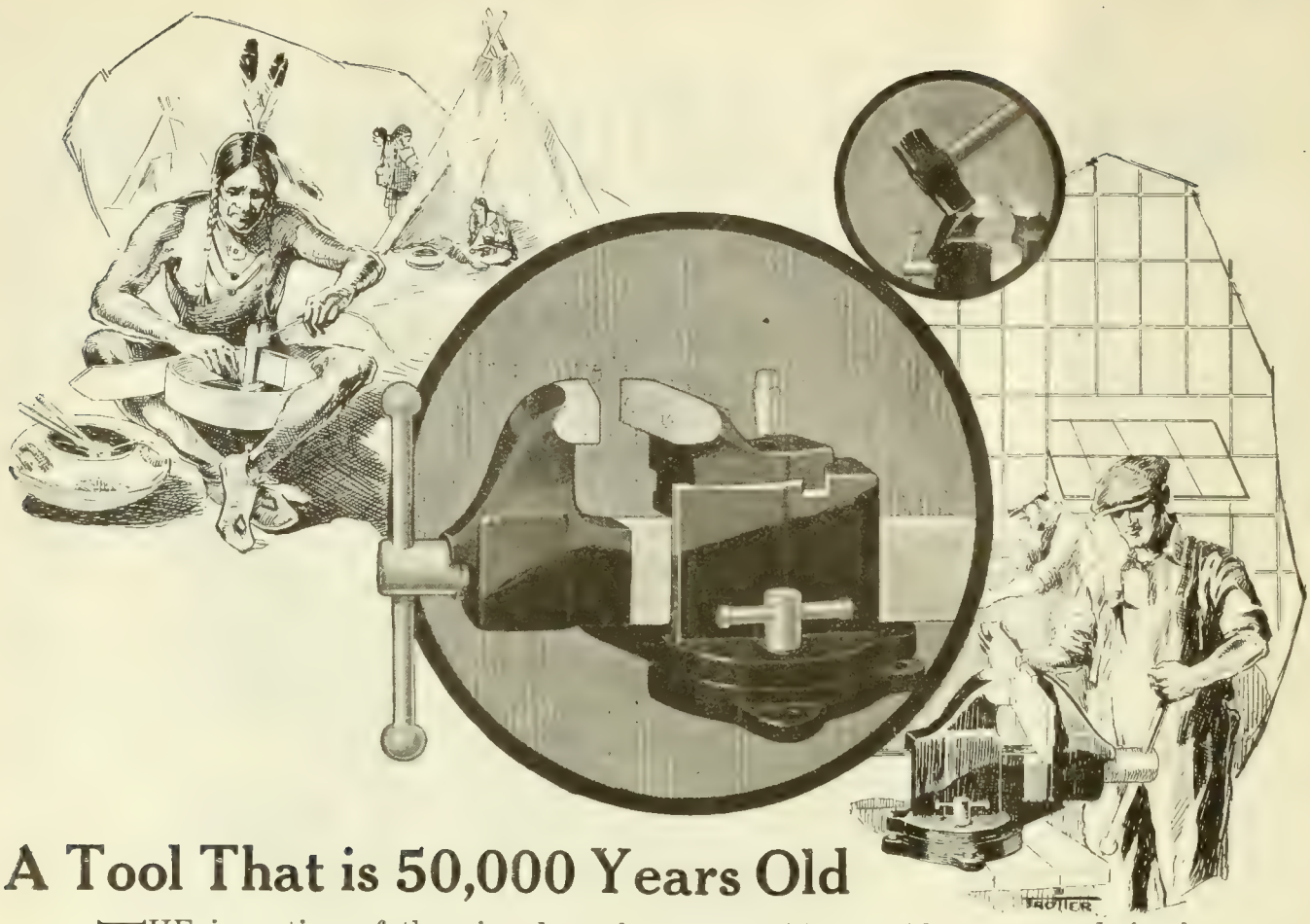

A Tool That is 50,000 Years Old

THE invention of the vise dates back probably 50,000 years, and in its most primitive form was made of a forked branch bound with wet root or bark, which contracted as it dried.

From the very earliest times the vise has been one of the fundamental tools of industry—but it is only within a very recent time that industry has realized that every possible improvement in vises was of far reaching importance.

Columbian Sledge-Tested Vises are the most highly improved vises made today. They are the only machinists' vises that are made of malleable iron—and the use of malleable iron instead of cast iron is the greatest single improvement made in vises in hundreds of years.

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The screw is self-aligning by means of a cone bearing. The depth and width of the beam and its accurately machined bearing surfaces insure absolutely parallel jaws, yet the front jaw works freely all the time.

Columbian Sledge-Tested Vises are sturdy, rugged and durable. Yet they are so carefully made that they are the best vises for fine work. When you order vises specify "Columbian."

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World's Largest Makers of Vises and Anvils
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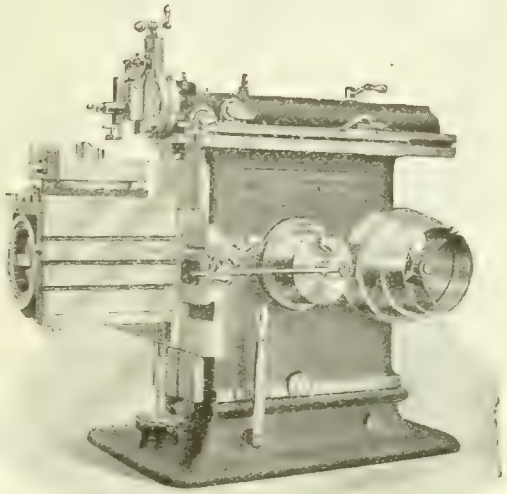
Sledge-Tested VISES

UNIVERSAL

SHAPING MACHINES



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Machines regularly furnished with—

Swivelling Graduated Table
Auxiliary Tilting Side for Compound Angles
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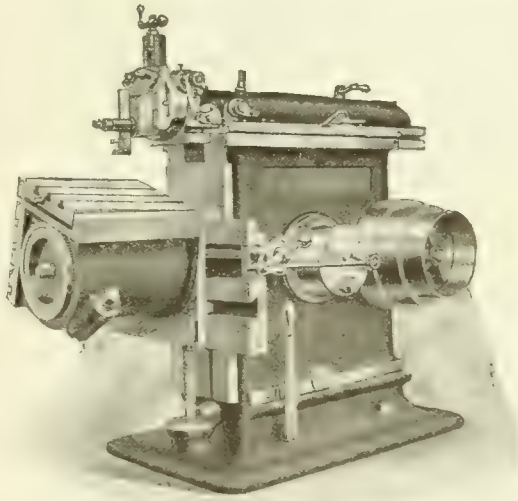
Table raised and lowered by power on 24-inch size.



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The tests we apply to a file before it is passed are so exacting that there is no possibility of flaws.

Weight, balance, sharpness, temper of steel—all are carefully checked.

It is this painstaking accuracy that has made the following brands the standard:

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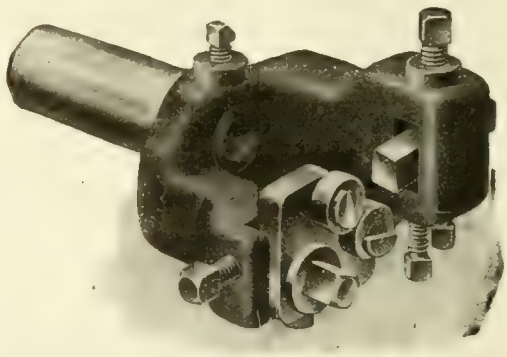

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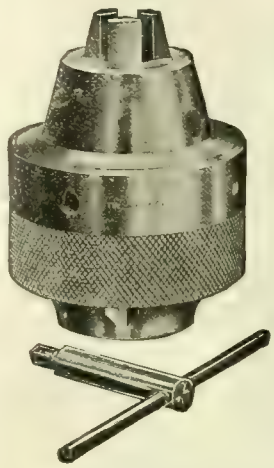

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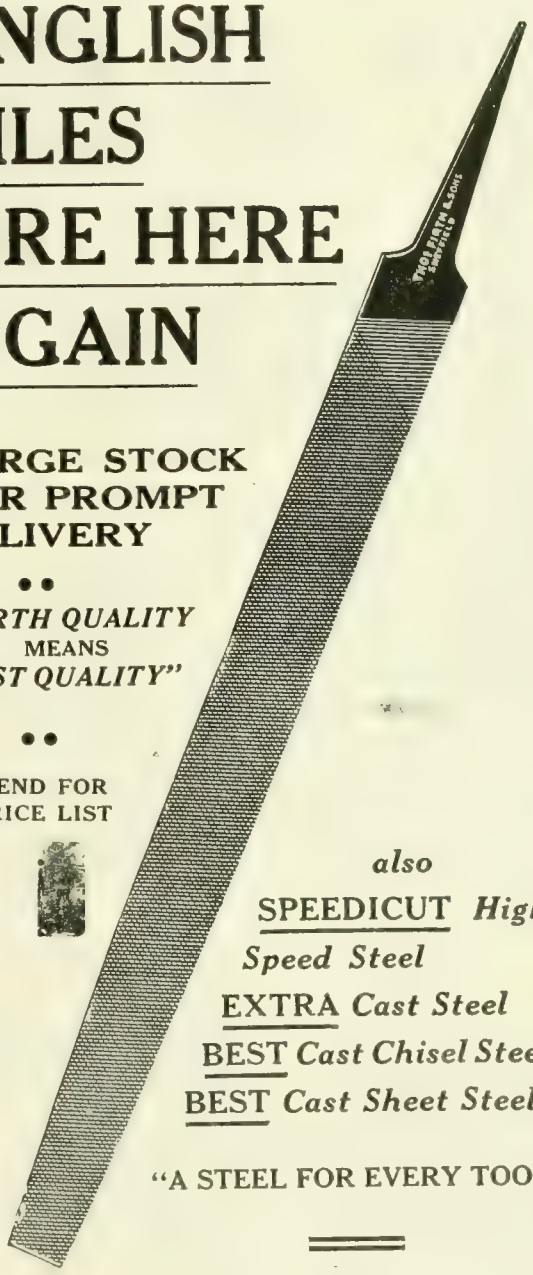

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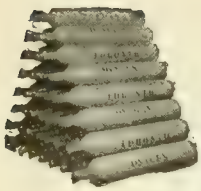

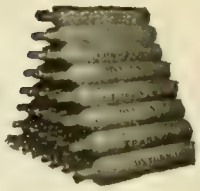

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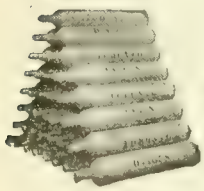

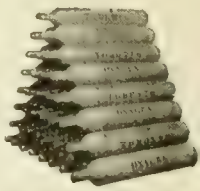

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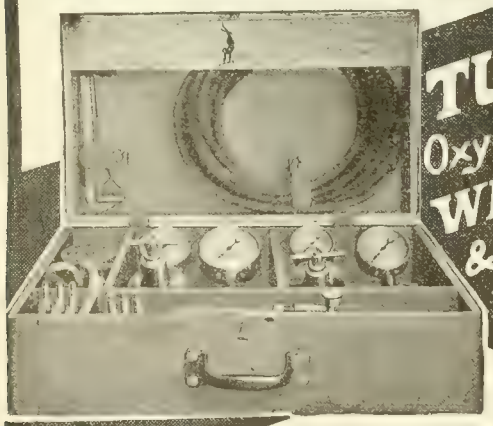

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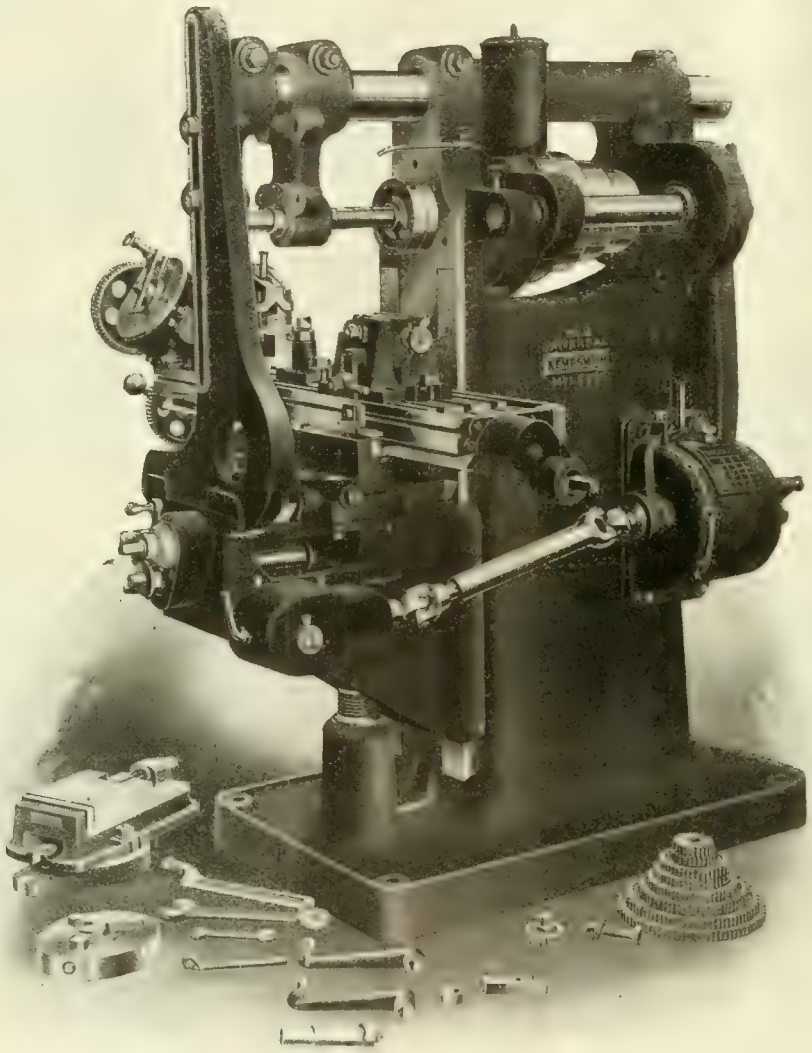

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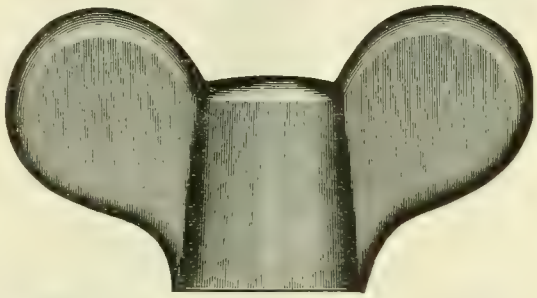

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You're on the right track when you make this resolution. See that your purchasing department orders **Murchey Solid Adjustable Taps** next time. You'll find they are the most economical you ever used. Here's the reason:

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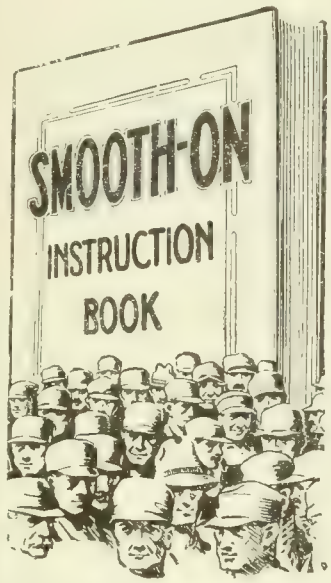
What Other Engineers *Know* About Repair Work, This Free Book Tells *You*

It is full from cover to cover of practical ideas developed to meet actual emergencies. There is no theory in the



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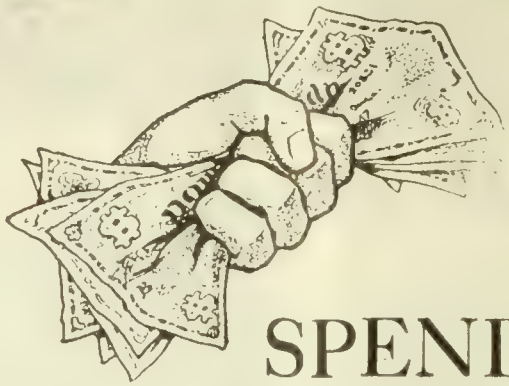

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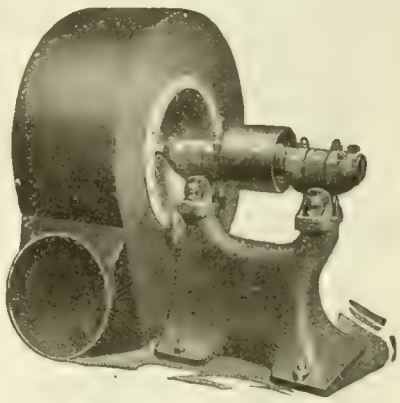

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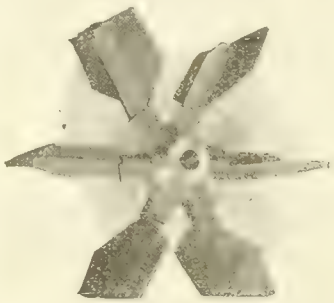

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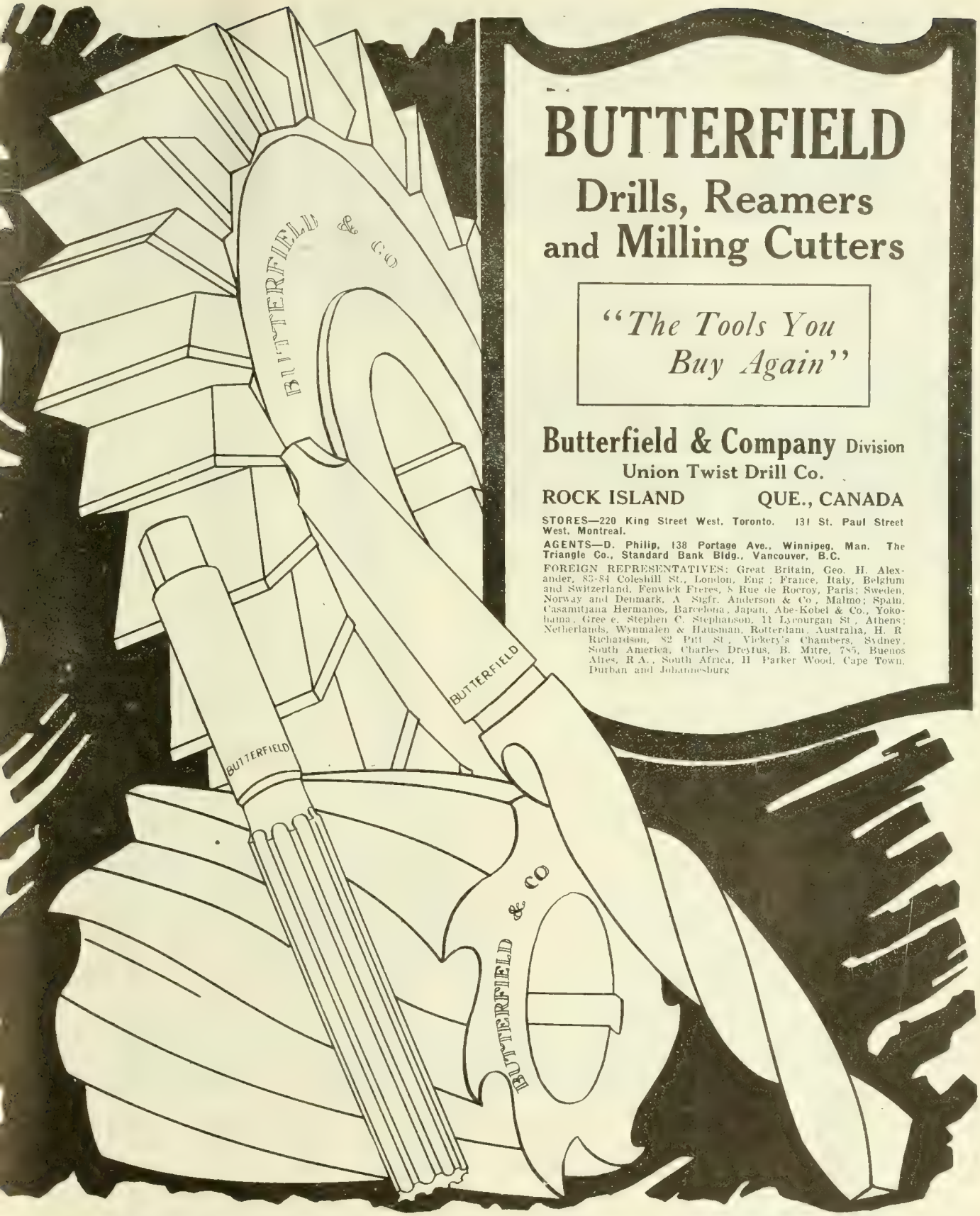

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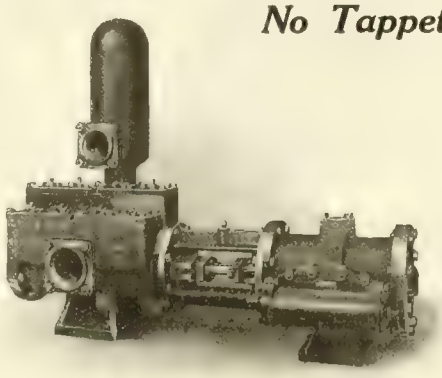

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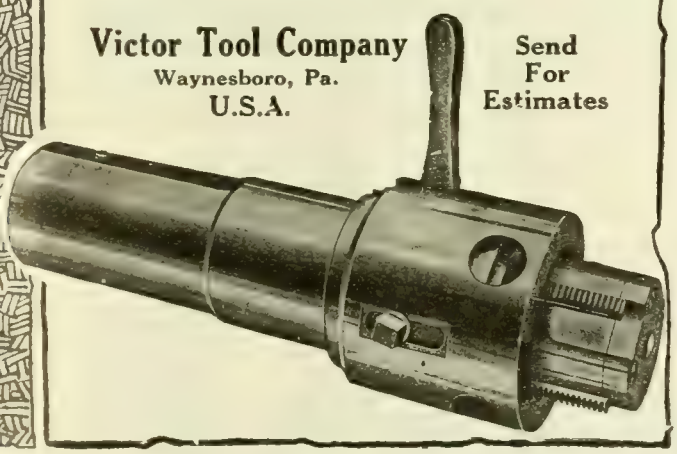

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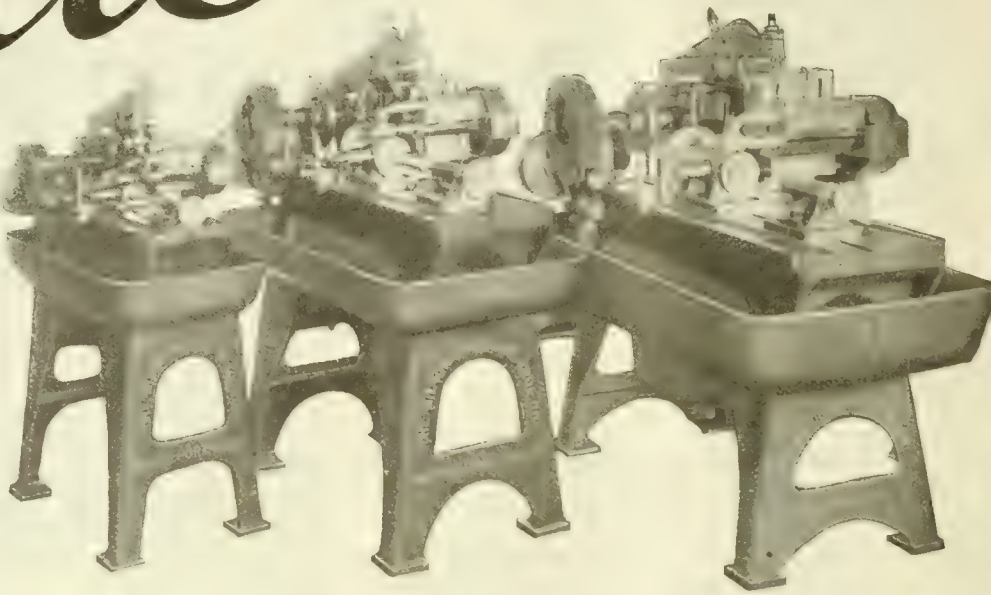

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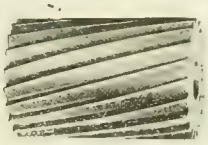

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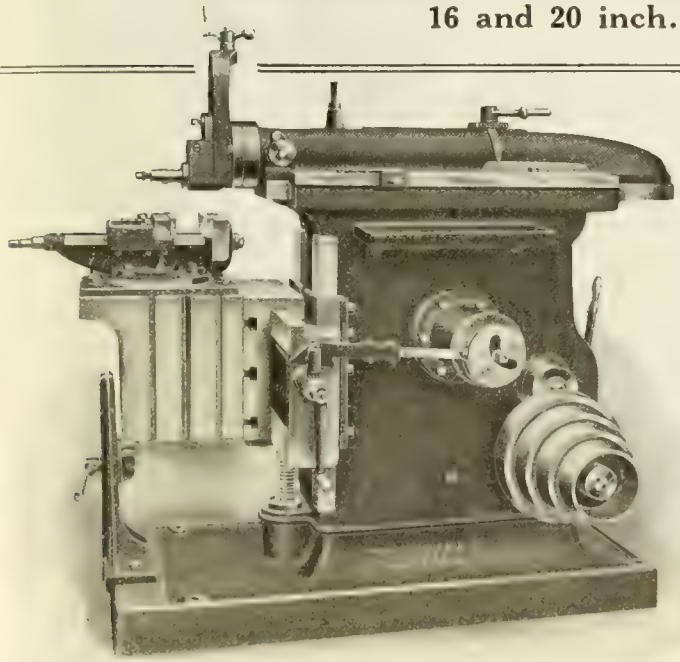

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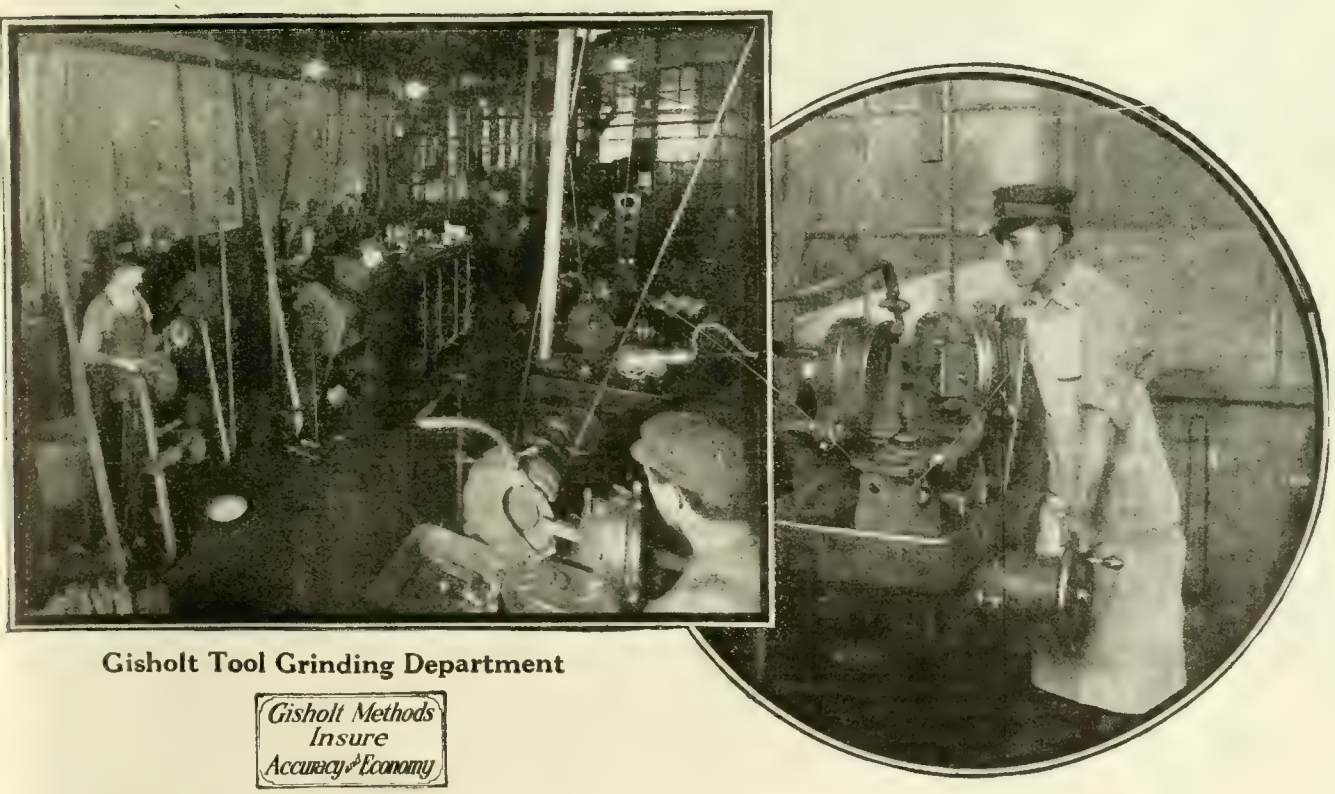

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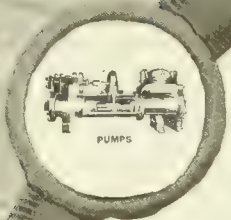

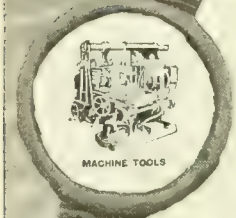

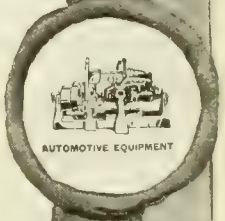

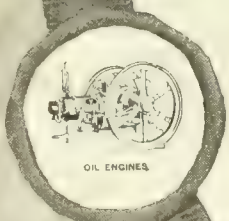

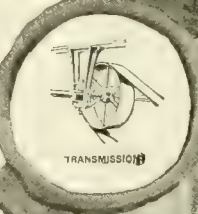

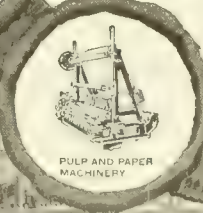

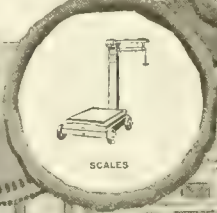

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 4 January 27, 1921

Correcting the Alignment of Machine Tools

Various Methods of Correcting the Alignment of Spindles, Slides, Heads, Cylindrical Bearings, Clamping Devices, Turrets, and Other Parts of Machine Tools

By F. HORNER

THERE are numerous forms of adjustment and correction necessary in machine tool construction and operation, comprising such things as the initial setting up, the finer corrections for alignment and squareness, the tuning up required before, and sometimes after, trial runs, and the rectification of bearing and slide fits.

In this article we will consider yet another feature, comprising a certain class of correction which is only made at comparatively rare intervals, once at the time of assembling or testing the machine, and subsequently at periods ranging from weeks to months or years, dependent on various considerations. These particular corrections are for putting right the alignments of spindles, slides, head, and various holding devices, and for absorbing backlash which develops through the wear of the parts.

With all the precautions in manufacture, opportunities still creep in for little inaccuracies to arise, partly due to the results of wear, partly to over-strain, and partly to misuse of the machines, or defective corrections in other ways. Cylindrical bearings, for instance, can easily be thrown out of alignment by improper taking up of the wear. So may slides and heads of various sorts, clamping devices, turrets, etc. The most important factor in regard to maintenance of alignment is undoubtedly rigidity, which refers not only to the fixed portions of frames, bases, etc., but to the stiffness of moving parts; if the latter can be sustained with firmness, and are in themselves stiff and rigid, the machine will wear for years in an accurate manner. But if the walls of the framing are weak, easily buckled, and liable to permit of vibration, the chances of retaining perfection of alignment are small.

The effects of heavy loads, including the mass of the slides or tables, the weight of jigs, fixtures, and work, and the pressure due to cutting, are such that the deflections arising from weakness of support tend to wear the parts cornerwise, as it were, instead of in a straight unswerving path. The amount of error produced in a given time may depend upon the line of pressure resulting from the cuts. For example, a good deal of side pressure or localised cutting at one end of a traverse, will more rapidly accentuate errors. Tables will even bend under the influence of weights too severe for their strength, or because a piece of uneven shape is bolted on, and the bolts strain the table up into a slight curve. Here is another cause of alignments getting rapidly out of truth, and this is why so much stress is laid upon the efficient ribbing, bracing, and thickening up of bases, columns, tables, and supports of numerous kinds. In order to secure inertia of a sufficient amount to withstand vibrations, with all their

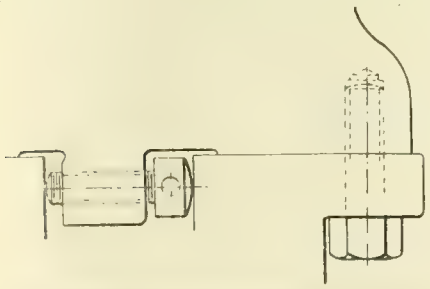


FIG. 1. SCREW FOR ALIGNING LATHE HEAD

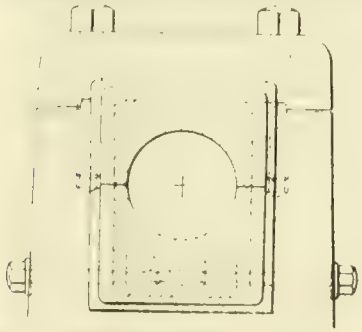


FIG. 3.—TURRET LATHE SPINDLE BOX WITH VERTICAL ADJUSTMENT.

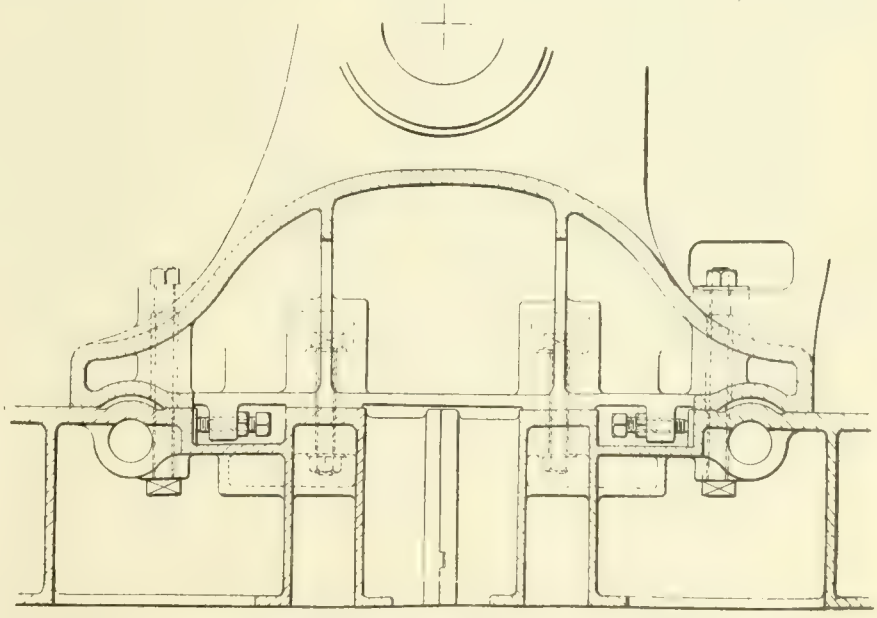


FIG. 2. LARGE LATHE HEAD WITH DUPLEX ALIGNING SCREWS.

destructive effects upon work and machine, the mass of knees, slides, tables, and spindles must be enough to resist the vibratory influences. The thing, however, must be done properly and consistently, since the strengthening and massing up of one portion will fail to afford proper protection unless the companion elements are also treated properly. Vibration extends to several adjacent parts, and becomes cumulative, hence the necessity for intelligent interrelation of design, and of adequate proportioning also of driving mechanisms, comprising screws, racks, shafts, and of clamping devices.

Watch the Cutting Pressure

Vibrations, as well as deflected direction of movement, causing unequal wear, are made worse by unbalanced conditions of cutting, and the endeavor should always be made to equalize cutting pressures on opposite sides, along edges, and to provide resisting media in the shape of supports, pilots, steadies and other details. Then the machine will have a better chance of keeping in an accurate condition, while the work will give less trouble in regard to parallelism, even thicknessing, and general alignment and squareness. These important requirements tend to become more and more exacting as pieces have to be tooled to close limits, and guarantees have to be given of the state of accuracy of the machine, or of pieces machined.

Certain occurrences affect the working of machine tools in an irregular and sometimes rather subtle way. The usual line of pressure of a tool may wear bearings and slides in a nearly constant direction, so that the designer is able to anticipate the path of such wear, and provide suitable recompenses. But under some classes of working the wear may turn out to be of an uncertain character, and what is rather awkward, of a local

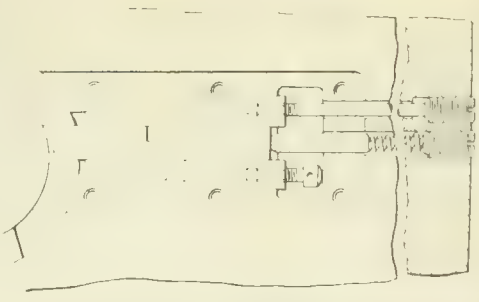


FIG. TAKE UP AND CORRECTIVE STRIPS FOR TURRET LOCKING BOLT.

nature. In the latter event, it may not be feasible to provide anything in the way of an easy corrective method, and the only thing is to properly overhaul the machine at a certain interval of time, and reface or scrape a whole bed or slide so as to restore the pristine accuracy.

Neglect to take up slackness at a sufficiently early period is responsible for some of the faults found in machines while in use. They may proceed with their operations satisfactorily, notwithstanding the slacknesses which have developed to a slight extent, but damage is being done all the time because the contacts are more localized (both in round bearings, and in flat sideways) and wear occurs correspondingly, at sides or on corners instead of over a larger area. And as these restricted areas revolve or rub together they naturally wear faster than if the whole designed bearing surfaces made contact.

Eliminate Backlash

Many of these remarks apply equally to alignment and to backlash conditions. The presence of backlash in movements has not always such a decisive effect upon the work, but is frequently more of a time-wasting character. But if accurate reversals are desired, backlash needs to be strictly eliminated, either by absorbing all of it by adjustments, or by appropriate hand correction before making a fresh movement. It is proposed to consider alignment adjustments first.

In the course of manufacturing a machine, the mode of rectifying the alignment as the building proceeds often depends upon certain features in the design. There may or may not be a simple way of diverting the alignment of heads, for instance, this depending on how they are attached to the beds. Heads resting on vee ways, as a case in point, are automatically aligned, and cannot be re-adjusted by the simple process of swivelling them or pushing them over bodily, which method is easy with heads set on flat surfaces. Sometimes, therefore the latter advantage is obtained by discontinuing the vees after the spot where a saddle or slide moves, and clamping the head on a flat area. Or the vees are still carried along, but special provision is added to the bearing arrangements to permit the spindle to be thrown slightly to bring it in line.

In recent years the American or vee design of bed has come in for some notice because of the alleged rapid rate of wear that occurs, by comparison with the English, or flat lathe bed. Endeavors have been made to delay the wear of the vee bed by chilling the ways, and by modifying the profile in such a manner that an increased width of bearing surface is secured at the place where the principal thrust takes place.

Wear of a bed is both downward and lateral, with the result that work cannot be turned parallel. In the case of turret lathes further complication arises because of the several concentric surfaces that require to be turned, bored, threaded, etc., and the fact that numerous tools have to be brought into action. Any defects in alignment of spindles, slides, or in the indexing mechanisms are soon released in testing the product. To a certain extent compensations may be made in the operation of a few of the tools, which overcome the defects present in the machine, but this does not apply to all, nor can it make up for all the deficiencies of action. In English practice, a favored mode of correcting the alignment of a lathe head is through cross-setting screws. The head is tongued loosely into the bed, and either one or two screws set into the tongue at each end of the head provide a method of cross setting (and of swivelling) before the holding-down bolts are tightened. Subsequent rectifications may be therefore made with ease.

A single-screw lug is illustrated in Fig. 1, alternative of two screws being often practised, each screw starting in from the opposite sides of the hole, and pressing with its head against the bed tongue. This takes some of the side strain off the holding-down screws, a point not so certain with the one-screw method. On massive lathe heads the

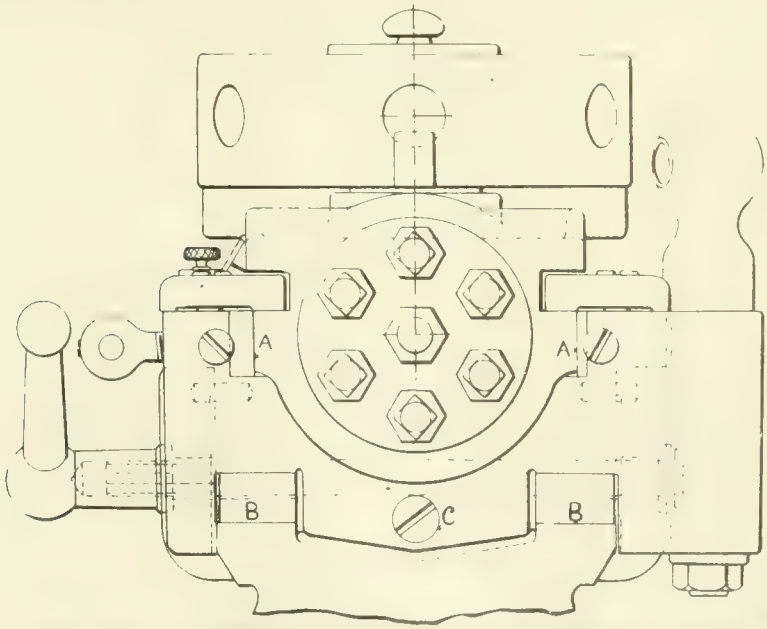


FIG. 1. REAR VIEW OF BROWN & SHARPE TURRET WITH STRIPS FOR LATERAL AND VERTICAL ALIGNING.

ugs are necessarily duplicated, and spread well apart, so as to increase the resistance to twisting. An example of this may be seen in Fig. 2.

Cause for Anxiety

The fit of the loose head is a cause for anxiety on the flat bed lathes because there is no automatic aligning feature present, as in the vee top. The tongue of the poppet must be a trifle slack in the bed to allow of easy sliding, so that the groove cannot be depended on for aligning purposes. The best thing to do consists in making use of one edge constantly for every re-alignment, letting the tongue fit very freely, so that there will be no friction and wear against the edge. The clamping device is then constructed in such a manner that the head is invariably drawn over against this guiding edge, a guarantee of accuracy, provided it is not burred or otherwise damaged.

A fresh set of circumstances arises when heads are cast solidly with their beds. The opportunity for lateral correction, or for vertical adjustment by scraping the head is not present. The alternative is that of modifying the spindle position by moving the bearing boxes, or by correcting the path of movement of a turret or other tool slide. Both practices are followed by various designers, preference being given generally to the latter procedure. If only a vertical adjustment is afforded the spindle, compensation for the lateral defects of alignment is arranged in the form of double gibs flanking the turret slide. Fig. 3 is an instance of height correction for divided bearings of a head cast in one with the bed.

Both boxes are machined at an angle underneath, to coincide with the wedge seen, and the adjustment of this in either direction by means of the pair of screws elevates or lowers the spindle centre. An exceptional practice, of which only one or two examples are apparent, is that of fitting the head to a sloping face on the end of the bed, so that it can be slid up or down this to bring the centre height correct.

The lateral alignment of a turret slide, if the headstock possesses no corrective fitting, is a matter of furnishing a gib on each side and setting these up relatively until the turret holes are found to be in alignment with the spindle axis. The gibs are either of the direct lateral closing in pattern, forced against the edge by a row of screws, or—which is a better construction — they are tapered, and pushed endwise, giving metal-to-metal contact all along. An end view of the Brown & Sharpe turret for the firm's hand screw machines is shown by Fig. 4; the lateral alignment correcting strips, of relatively reversed tapers, are lettered A,A, while vertical adjustments are practicable by a one-piece sole or frame, tapered from front to back, the parts which rest on the bed and sustain the turret saddle being marked B,B.

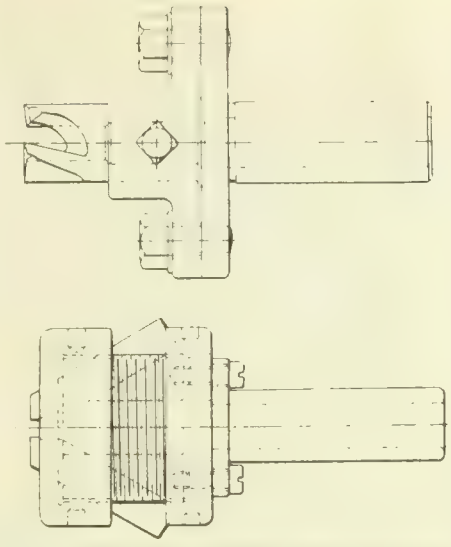


FIG. 6. SET OVER FLANGES FOR HOLLOW MILLS.

There is a screw C located at each end for the function of drawing the frame to or fro.

Given a corrected movement of a turret slide, it does not follow that every tool hole will line up truly. The holes may have been pulled somewhat out of shape, or the indexing bolt may be defective in action. In the latter case the results are uncertain every time the turret is swung around and locked. The correct thing is to have no slackness in the fitting of the bolt, and to be sure that no grit or dirt is present to prevent it from fitting properly into the turret locking ring. Prevention of slackness as regards the bolt can only be ensured by fitting a gib alongside it, so as to press it constantly against the same face all the time, the taper nose of the bolt taking care of the turret position after that. But it should be noted that the application of one gib only has a tendency in time to let the side of the bolt and its contact face wear to one side, hence the double gibbing system, like that in the Bardons & Oliver turrets, Fig. 5, is to be preferred, from the point of view of centralizing.

Watch the Details With Care

Notwithstanding all the care which may be exercised in putting right such alignments, very small discrepancies are likely to be present, and means are luckily available for introducing a further adjustment in connection with the tools themselves, after they have been placed in the turret. This adjustment assumes the form either of a cross and vertical setting, of such magnitude and direction as may be found necessary, or of a floating hold that constantly accommodates itself to the faint inaccuracies present in the lining up of the turret holes. The first device generally consists of a flanged union with setscrew fastening allowing sufficient freedom before tightening up. This is represented in Fig. 6, showing a holder for a solid hollow mill, and an adjustable ditto. The floating class of holder, employed for such tools as reamers, taps, and dies, has a small degree of looseness in the connection between the parts, so that the tool will adjust itself automatically to the work. This principle, of course, is only applicable to such operations as those of a following nature, on parts already turned or bored, or for such tools as will automatically centre themselves by the effect of the centrifugal force of rotation. Some amount of discretion is required in applying these adjustable and floating holders, otherwise the work may suffer in accuracy or finish from neglect to keep the main alignments of the lathe up to a good pitch.

The adjustment of certain other ma-

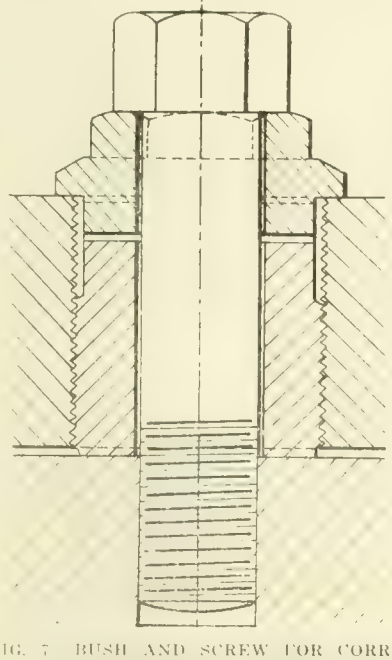


FIG. 7. BUSH AND SCREW FOR CORRECTING AND FASTENING BLANCHARD GRINDER COLUMN.

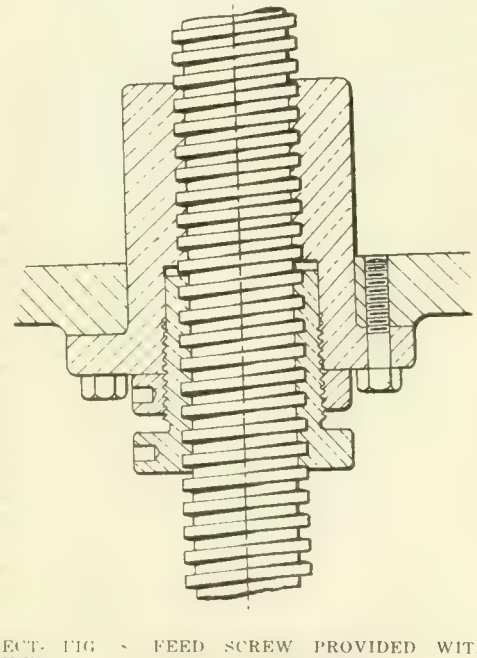


FIG. 8. FEED SCREW PROVIDED WITH TAKE UP FOR WEAR.

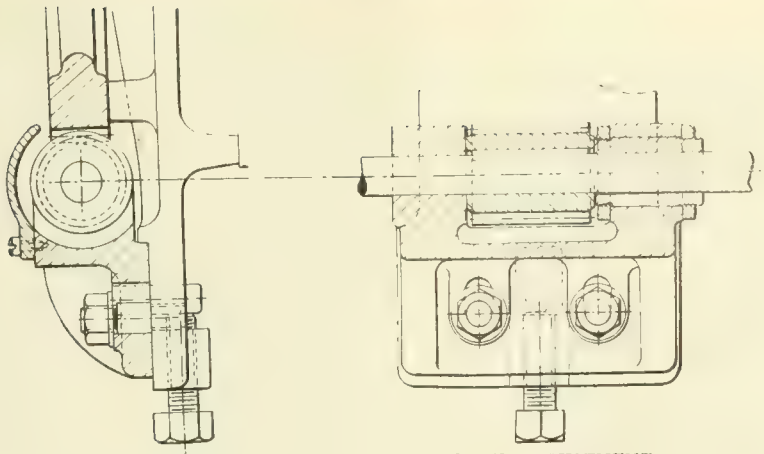


FIG. 9.—WORM BRACKET WITH DEPTH ADJUSTMENT.

chine parts is effected in various ways, as may be demanded from the special shape of the machine. If vertical faces are joined, and it is desired to produce a small degree of modification in their mutual relationship, a good method is that of the three-screw principle; a centrally-situated screw or bolt pulls the faces together, and two others flanking it allow for tilting the relative parts. Further locking may be accomplished by other fastenings after making use of these adjusting screws. In such manner a standard or head can be thrown one way or the other to align a spindle or slide, or a table can be levelled in relation to a spindle above it. Some of the lighter type surface grinders require provision for tilting the table to permit concave or convex grinding to be performed; in these examples the tilting arrangement also furnishes a mode of adjusting for level, a distinct construction from that just specified.

The Blanchard surface grinder is built with a peculiar type of alignment correction, by means of which the massive head carrying the spindle may be tilted in the direction necessary to make the wheel produce flat surfaces. The head does not rest upon the bed, but contact only depends upon three bushings threaded into the base of the column. The state of this three-point support is capable of alteration by suitably manipulating the bushings, so as to raise or lower the head at one or other of the supporting spots. A washer above each bushing connects to it loosely by slot and tongue fitting, so that when the washer is turned by a spanner on its hexagon head the bushing screws its way in or out of the column hole. Then binding is done by tightening the set-screw which passes freely through washer and bushing. The parts are seen in Fig. 7. It may be mentioned that two of the bushings are located at the front end of the head, flanking the spindle head slides, and the other at the rear. The washer on the latter is graduated in order that tilting may be done, and settings duplicated for concave or convex grinding.

In designs of grinding and other machines where rapid change from parallel to tapered working is wanted, a swivel construction is often incorporated by which the slewing of the head or of the wheel spindle base may be accomplished. The return to normal, that is, parallel setting must be accurate, if time is to be saved in trial cuts and measurement, and the change also ought to be rapid. Hence the method of returning to position by reference to graduations does not always commend itself, and a better way is to fix a dead stop, which if kept clean, answers admirably. This must be made with some device for adjustments to make up for wear and other faults which develop. For the very finest class of work even such a provision does not avail any more than setting to graduations, and the only course open is that of trial cuts, a fact which those accustomed to doing long parallel grinding upon machines made with swivel tables will be acquainted with.

Reversal of Motion

The disadvantages which accrue from the presence of backlash are chiefly concerned with reversals. So long as a pressure is steadily maintained in one direction the effects of looseness in fitting parts usually has no ill result. But such is not the case when a reversal of the motion happens, and undesirable or serious occurrences are liable to arise, together with shock, and destructive action. Two principal situations may be mentioned where backlash is of the greatest disadvantage; one where a screw is used for driving a heavy table, with periodic reversals, the other when a worm pitches round a worm-wheel for indexing purposes. In the first, the looseness of the threads would afford an appreciable interval before the screw commenced to reverse the table, and a sudden and severe shock would come upon the parts and the driving gear, while in the second the accuracy of indexing would be open to question. Some other kinds of backlash are merely annoying, by reason of the interval which elapses before the reversal of a handle or wheel takes any effect, and in regard to others, one needs to be careful to take up the slackness before starting, say a micrometer reading.

A practicable device for the removal or rather absorption of backlash in certain specimens of feeds or drives is that

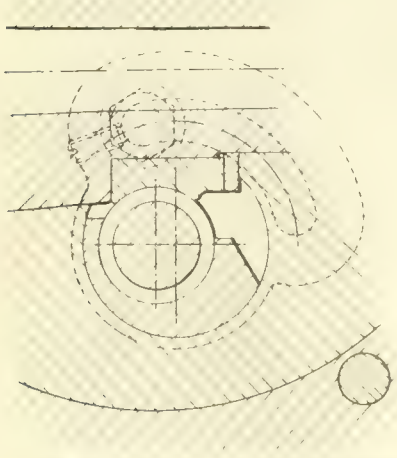
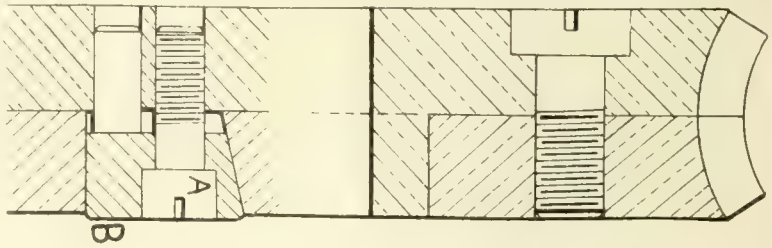


FIG. 10. THROW OUT AND DEPTH ADJUSTMENT FOR WORM.



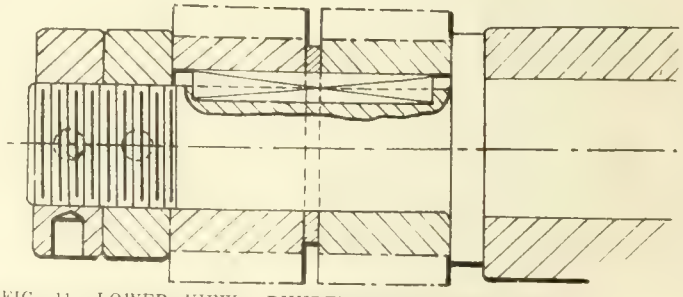


FIG. 11. LOWER VIEW. DIVIDED WORM FOR TAKE UP.
FIG. 12. TOP VIEW, SHOWING METHOD OF ADJUSTING AND CLAMPING SPLIT WORM WHEEL.

a counter weight disposed to exercise continual pull and thus prevent a le from slacking off. But in the linary way the most effectual plan lies the actual absorption of play between related elements, as the threads of screw and its nut, a worm and its eel teeth, or a block and its link. The te up for threads depends on the meter, and the type of nut used.

A common fitting is the gland style, ich as in Fig. 8) about half the nut gth being bored out, threaded with a e screw, and fitted with a loose nut. is is turned slightly to consume the ckness and then locked. When a t is cast in bracket shape, to go along- e a knee or other portion, the dodge simply splitting the casting and of ntracting it with a screw suffices. This es not answer for big nuts, and a table form to make these is in halves, e half being bolted fixedly to the der side of the table or other element, d the other half to a short facing, justing screws affording the means of rcing this loose section along until the ntact with the thread flanks is perfect.

The taking up of backlash in worm eth can be carried out in either of ree ways: (1) Pushing the worm di- ctly in towards the worm-wheel; (2) viding the worm into halves and draw- g them together; (3) making the eel in halves in a plane parallel to e flanks and twisting one part upon e other.

Construction (1) often requires to be corporated along with a throw-out mo- n, for the purpose of spinning the eel, and it is then necessary to in- ude a dead stop to arrest the inward tting of the worm box after each row-out has occurred. This stop be- g finely adjustable gives facility for ndering the degree of backlash nil. g. 9 depicts a plain worm box (for a viding wheel) with the worm adjusted to the limit; the pressure of the bot- m screw against the pin let into the orm box flange forces the latter up, d the two studs and nuts provide for amping. Dividing heads for milling achines are so constructed that the ace available for the worm adjustment vice is rather limited. This is the ason for the choice of an eccentric eeve in many designs, the worm being rried in a casing the outside of which eccentric in relation to the worm axis. ie disposition thus provided allows of thdrawing the worm when its services e not wanted, and of giving a nearly raight line adjustment for backlash sorption. The quadrant, see Fig. 10, the outside of the head permits of the row-out, and the stop screw at the one d regulates the entry of worm.

Fig. 11 shows the divided worm, a use- l idea if it is not convenient to set to the wheel for take-up, or the worm employed in conjunction with a long raight segmental nut. The washer tween the halves is slightly thinned to enable them to be drawn together a trifle, and correct inter-relation of the worm threads is rendered certain always by the single key fitting the bores. The split wheel may be noted in Fig. 12, showing one of the types of adjustment. Here the halves are united by screws passing through slots and the rotational effect occurs when these are loosened, and the screw A turned in, causing the wedge B to twist the half disc. An alternative adjustment is to screw a peg into one half, bring it up through a slot in the other half, and set by a screw passing through the head of the peg.

CUTTING A WORM WHEEL OF METRIC PITCH

By G. Barrett

A few months ago I had an accident to a gear cutting machine of German make. The accident caused the breaking of the large worm wheel which revolves the table of the machine.

After carefully measuring the pitch of worm, and the best part of the worm wheel, I decided they were 9 millimetre pitch. This proved to be correct. This wheel was cast and turned in the usual manner, then gashed out in a miller. It was next placed in a horizontal position so as to generate with the special hob which had to be made to get the desired pitch.

In making this hob we had to gear the lathe to cut the metric lead. Here is how we figured it out. There are 25.4 millimetres to one inch, and a metre is 39.37079 inches, which is approximately 39⅜ inches. As there are 1,000 millimetres to the metre, the error is only about 1-200 part less than 39⅜. As the length of the work decreases, so will the error in measurement.

The next step is to bring 39⅜ to an equal number. Since there are 1,000 millimetres to a metre, there are 8,000 in $39\frac{3}{8} \times 8$ or 315 inches. The lead screw of the lathe was 2 threads per inch, so we multiplied 315 by 2, making the answer 630 threads in 315 inches, this equalling 8,000 millimetres.

If the screw of one millimetre pitch was required, the ratio between the screw and lead screw of lathe would be 630 : 8.000, or 63 : 800.

As the millimetre pitch is less than that of the lead screw, the small pinion drives the larger gear in the change wheels. In working out the change wheels for any screw of millimetre pitch this fraction is a constant number, and a special wheel had to be cut, having 63 teeth. To find the change wheels required you multiply the constant by the pitch of the screw desired. For example:

Hob to be cut 9 millimetres.

$$\text{Pitch } \frac{63}{800} \times 9.$$

Resolved into fractions we have

$$\frac{63 \times 9}{80 \times 10}$$

By adding a cipher to the 9 and another to the 10 we get the wheels required

$$\text{Driver, } \frac{63 \times 90}{\text{Driven, } 80 \times 100}$$

Very accurate results could be obtained by using a special wheel having 127 teeth with a lead screw of ½ inch pitch.

There are 25.4 millimetres to one inch, and with a lead screw of one inch, pitch and change wheel of 10 and 254, a screw of one millimetre could be cut. This is simplified by a lead screw of ½ inch pitch, and a change wheel of 127 teeth. The result is that a 10 tooth wheel on the change wheel shaft will cut 1 millimetre, and an 11 tooth wheel 1.1 millimetre pitch, a 15 tooth wheel 1.5 millimetres, and so on. For example:

Find change wheels to cut thread 5 millimetres pitch with lead screw of ½ inch pitch.

$$\frac{\text{Drivers}}{\text{Driven}} \quad \frac{5}{127} \times \frac{2}{1} \times \frac{5}{1} = \frac{50}{127} = \frac{25}{127} \times \frac{80}{40}$$

The ratio of these wheels

$$\frac{50}{127} = 39370 \text{ to } 1 \text{ inch},$$

which would be considered very accurate in relation to our knowledge of the metre and the inch.

ADVANTAGE OF STEEL FENCES

The day of the wooden fence about the plant is gone. Wooden fences have outlived their usefulness. They never were highly satisfactory, but for want of something better they continued in use until the advent of the present steel-post, wire-netting and barbed-wire fences.

The various systems of steel fencing are more or less designed along the same general lines. They consist of various styles of steel posts, which are set directly in the ground or are imbedded in concrete, and stout steel netting. Fences of this kind protect the plant against trespassers, thieves, firebugs and other undesirables. Indeed, the steel fence is so secure that it virtually extends the storage space of the plant buildings beyond their walls, since the yard becomes just as secure as the store rooms, so far as theft and fire are concerned. It also protects the workmen against accident by preventing their crossing dangerous railroad tracks, taking reckless short cuts, and so on. It simplifies the handling of workmen, since it limits their entry and departure from the works to certain definite gates. All in all, the steel fence marks a big step forward in plant efficiency, both from within and without.

Adopting Mechanical Ideas in Toy Making

By J. H. Moore

"TOY making." The subject does not sound very much like a machine shop article, does it? And yet there is such an amount of machine shop experience embodied in the work accomplished at the school for disabled soldiers at Hamilton, Canada, that the tale is worth the telling.

In this school are manufactured all sorts of toys, but before going into the actual making, perhaps we had better explain the purpose of the school itself. The workers are all returned soldiers who are so disabled that they are unemployable in the open labor market.

When the government came up against the problem of supplying these men with congenial work, they realized that whatever was started must not be run on any hard and fast hours of labor, as the disabled condition of some of the men would prevent their working more than a few hours at a time. This ticklish point was successfully overcome, as will be found out later on in the article.

Having decided on toys as the product the next thing was to start a school where the men could be instructed in the art of toy making. This was done in a humble way in an ordinary dwelling house, but the demand for the toys made became so great that larger quantities were necessary, so the school was moved to the present quarters in the Hamilton Collegiate building. Having thus explained briefly the history of the school, let us see how the men fare in the matter of wages.

Vocational Wages

The workers all receive their pensions, this amount depending upon their disablement. In addition to the pension, the government supplement this to the vocational standard. The amount is made up irrespective of the worker's productive ability. Suppose a man is so disabled that he can only work a few hours per day. This makes no difference to his wages as it is the condition of the worker, not the amount of work produced that counts.

The regular hours of work are from 9 a.m. to 12 a.m., and from 1.30 p.m. to 5 p.m., but should the medical adviser decide that a man is not capable of working these regular hours, he issues instructions to this effect. These ininstructions are of course subject to change as the worker improves in health. The medical adviser is at all times the judge of a man's capabilities.

Mr. Harold Saville, the manager of this school, gave us some very interesting facts regarding the method of handling the men.

"You see," he commenced, "the men we have here are really those who cannot get a job elsewhere. Sometimes their body is at fault. Perhaps their mind, or shall we say their perceptive powers are by no means bright. Our task is self-apparent. We must make their work interesting, yet simple. We must so arrange the steps of manufacture that a man cannot very well make a mistake. Some of these men come to us in very bad shape, but it is surprising what interesting work plus easy hours will do for them. The men are never rushed. In fact we would never think of hurrying a man. They can take it easy. A rest room is provided for their comfort, and they have a rest period of 15 minutes both morning and afternoon, so that taken in all it is small wonder that the workers are satisfied."

"I should imagine," I ventured, "that a man would stick around here as long as he could." "You're quite correct," came the answer, "but they don't get a chance except they are still not fit for the open market. You see the men are reboarded every two months, that is, they are brought before a board and examined. This board consists of a doctor, an industrial man, and a vocational officer. After examining the man, this board decides whether he is fit for outside work, or should be re-admitted for a further period to the school. Should a man be pronounced fit for outside labor, every effort is made to place him in a congenial position."

"Do many men improve sufficiently to go out into the open labor market?" I asked. "A great number have been successful in so doing," was the answer. "In fact more than we had reasonably hoped for ourselves. Indeed, if it doesn't sound too much like a boost for ourselves I might say that we have had visitors from all parts of the country looking into our system of training, even to some vocational training officers from Wash-

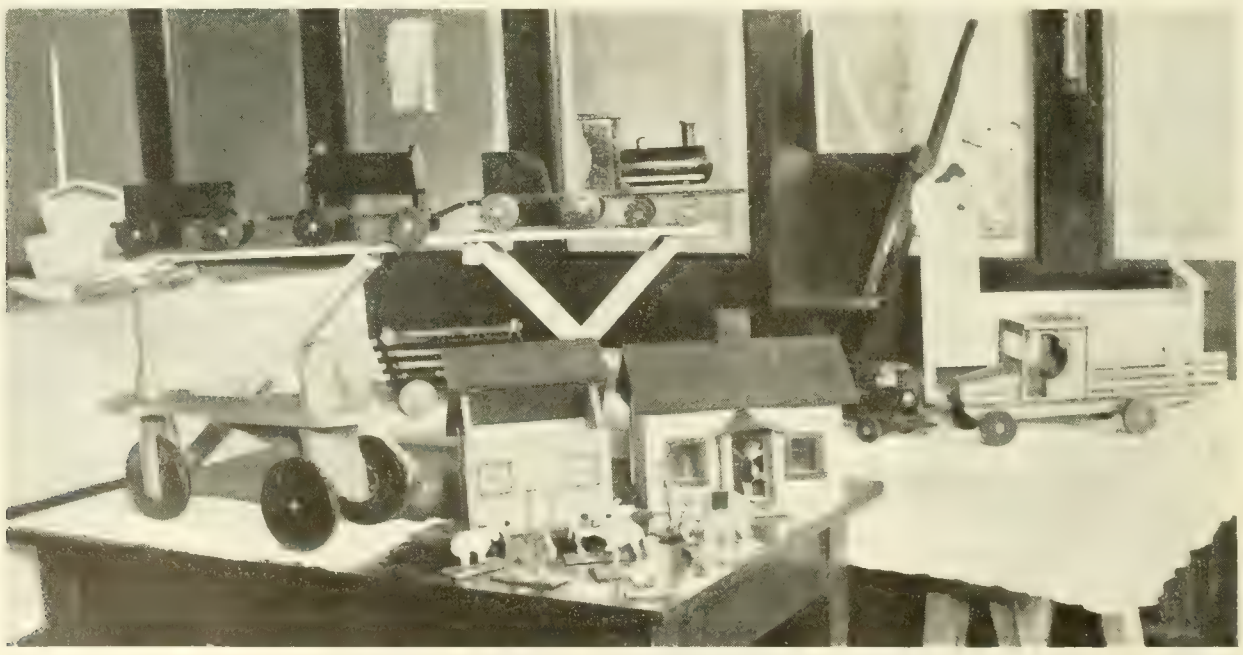


FIG 1 VIEW OF A CORNER OF THE TOY DISPLAY ROOM.

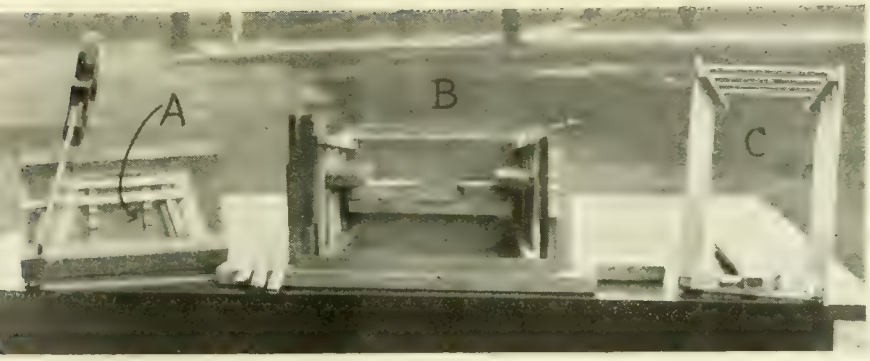


FIG. 2. THE VARIOUS JIGS USED IN THE MAKING OF A HAY RACK BODY

...ton, D. C. One thing I would like ...emphasize is this. In no case do we ...rk up sympathy. We do not go after ...siness in the way to follow 'buy our ...s, as they are made by disabled sol...rs.' What we do is this. We place ... toys on the open market, employ ...mpetent salesmen to sell them, and ...e our chance. In other words, we ...ke it, as near as possible, a commer...l proposition. So far, we have been ... from able to supply the demand. Our ...ck rooms never have a chance to get ...ed.

"Were you represented at the toy ex...it in the recent Toronto Exhibition?" ...sked. "We sure were," was the reply. ...n fact we landed second prize for our ...rk. The toys we have made have ...en sold in all parts of Ontario between ...ndon and Niagara Falls, and we hope ...still widen this territory."

"What happens to the money you ...ke from the toys?" I asked. "It goes ...ck to the government to help pay ... the material and the men's wages." ...is information having covered in a ...ef and general way the working of the ...ool itself, let us proceed to the actual ...king of the toys.

The Actual Manufacture

The first thought that struck the writ... on viewing the school was the system ...ployed. Every toy, no matter what ... shape, had a jig of its own. The toy ...s made in the jig. There was no ...ance of error, and production was ...ought up to as good a figure as pos...le, allowing of course for the con...ion of the men working on them. A ...eat variety of toys are made, these ...cluding hay rakes, kiddie kars, wagons ... all sizes, auto trucks, aeroplanes, cats, ...eelbarrows, cradles of different de...gns, ironing boards, engines, dumping ...rts, dogs, Noah's arks, dolls' houses, ..., etc. A fair idea can be gleaned ...om Fig. 1 which shows merely a few ... the toys produced. The work is not ...rown together but made in a good sub...antial manner, and being made in jigs ...ery toy is alike.

It was realized early in the game ...at standardization was essential. It ...as the coming to this decision that ...used the making of a jig for every toy. Take for example Fig. 2. Here we see the various jigs used in the making of the body for a hay rack. First let us look at the view to the left of the picture. This is the jig for making the ends of the rack. Note that all the worker need do is place the strips of wood in the slots, one of which is shown at A. After placing these in position he nails them to the braces, saws them even by means of saw shown in bevelled slot, and the end is complete.

After two sides are completed, they are placed in the jig shown at B. Two quick action eccentric clamps hold the ends in place while the side strips are being nailed in proper position. On one side being completed, the work is reversed, and the same procedure gone through. A completed body is shown at C.

Making an Engine

Next let us consider the making of an engine of similar nature to that shown in Fig. 1. First let us start at the boiler. On referring to Fig. 3, we see a few of the jigs used in the making of such an engine. A shows the first jig used. To make the purpose of this jig clear, we have reversed the piece of wood in the jig. At the bottom of the fixture are two holes, these being of the same size as the holes shown in the boiler (see B and C). On placing the boiler in the jig, the worker turns the jig over, and drills through the two guide holes, which are not shown in the photograph. These holes are drilled with a brace and bit, which has a depth gauge attached.

The next jig, D, is used to fasten the boiler supports. At bottom of this jig are two pins of the same diameter as the two holes already drilled. The boiler sets on these pins, therefore the supports are always in proper location to the holes.

The support being fastened in position, the funnel and dome are placed in position. E shows this stage of manufacture. The axles are next placed in proper position by means of the jig shown at F. Every part must go in a certain place, and must be of correct length, width, etc., to go into position. The axles are fastened to what is known as the bottom of the locomotive.

The coal box and cab are now placed in position, the locating jig G being used. Previous to this another workman has been busy making coal boxes in the jig H. It is unnecessary to go further into the various operations in the making of a toy locomotive. Enough has been given to show the careful thought that has been embodied in its making. All toys are the same. They are made in a strictly mechanical manner. Nothing is left to guess work, and every jig is made as fool proof as possible.

The painting of the tops is accomplished in a separate department set aside for the purpose. When necessary, various colored paints are used. The machine tool equipment consists of a band saw, circular saw, two lathes, a sander, and a jointer.

The toys are not made haphazard. Manufacturing costs are kept just the same as in any other factory. They charge the usual overhead expenses so that this item also figures in the cost of the toys. A system is kept that allows them to tell how many toys they have completed since the start, what balance has been left, and so on.

"What is your limit as far as style of toy is concerned?" I asked. "Give us sufficient quantity to make, and we'll make them, no matter what they are," was the answer received.

One cannot help but admire the work these instructors are doing, and it is perfectly safe to say that the results obtained have more than justified the idea.

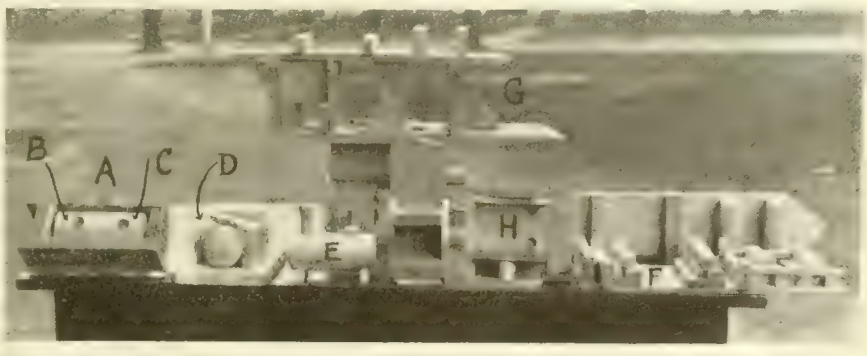


FIG. 3. SOME OF THE JIGS USED IN THE MAKING OF A TOY ENGINE.

The Machining of Monel Metal Castings

Cast Monel, Due to Its Extreme Toughness, Requires Tools With Keen Cutting Edges—Methods of Grinding Tools, Hardening and Tempering, Also Lubricants Suggested Are Given

By A. J. HANLON, Technical Department International Nickel Co.

MONEL metal is an individual alloy possessing distinctive machining qualities. Castings, when machined on the lathe, require tools with rounded cutting edges, pronounced back slope, or top rake, and keen cutting angles also a first-class quality of high-speed steel properly hardened and tempered, and comparatively low cutting speeds. Ease of machining is a function of the physical properties of a metal. Experiments made in our own laboratory indicate that cast monel requires more power to machine than mild steel. This power comparison should not be confused with machining methods for these two metals as they are entirely dissimilar.

Angular Shapes of Tools

Cast monel, due to its extreme toughness, requires tools with keen cutting angles. This necessary keenness may be best obtained without weakness of cutting edges by grinding the lathe tools with certain angular shapes. Tools so shaped permit the use of higher cutting speeds with a minimum of regrindings, both factors of extreme importance in economical shop production practice.

In Figs. 1 to 4 the important angles for roughing and threading tools (both solid tools and tool bits) are specified. The use of a tool holder with ⅜-inch and ⅝-inch bits in itself furnishes sufficient top rake without grinding. The toolholder, for example, holds the bit at a 30-degree angle.

The roughing tool (Fig. 1) is ground with a 13-degree clearance angle and 23-degree top rake. The nose is tapered gradually at an angle of 9 degrees from a plane parallel to the side of the tool and the cutting edge is rounded, with 3-16 inch radius. The sides on the nose are ground with gentle slope from top to bottom to obtain the 9 and 12-degree angles shown. Both angles are measured from a plane parallel to the side of the body of tool. Cast monel metal when turned, gives a long, tough chip. The large rake or back slope ground in the roughing tool helps materially to get rid of this chip by curling it. In that way it is prevented from concentrating the heat generated over the least sectional area (the lip surface), resulting in greater life under working conditions. The clearance angle is made small for the purpose of strengthening the tool, in fact, just large enough to preclude any possibility of rubbing the flank of the tool against the work. When machining a casting with a particularly hard outer skin, the cutting edge may be more blunt with beneficial result. This is secured by grinding the flank of the tool. A tool of this description has less tendency to cut cleanly but is stronger, better withstanding the hard knocks encountered in cutting the skin of any casting, due to sand holes or surface defects.

The number of uses to which monel metal is being put is constantly increasing. For this reason the present article will be a help to those who have not as yet used this particular metal. The material herein furnishes specifications for lathe tools for turning and threading, also some information regarding lubricants used.

For either ⅜ or ⅝ inch bits, Figs. 2 and 3, the clearance angle must of necessity be larger than that for bar stock tools, due to the position in which these are held in the tool holder. As no top rake is ground in the tool, this larger clearance angle of 25 degrees does not weaken it. With a ⅝-inch bit, 4-degree side slope should be ground back from the cutting edge in order that the chip may better free itself.

The threading tool, Fig. 4, on account of its pointed cutting edge, has a greater tendency to crumble. For this reason, rake and clearance angles are decreased to 9 degrees and 12 degrees respectively. Side rake, 17 degrees and 18 degrees, is measured from a plane parallel to the side of the body of the tool and is obtained by grinding the side of the nose on a gentle slope from top to bottom. The point of the tool may be ground for any standard thread desired.

The best method of dressing the tool is to turn up the nose or point ⅛ inch above the body of the tool. By so doing the maximum number of regrindings with one dressing may be obtained. The roughing tool shown in Fig. 1 is correctly dressed. The threading tool shown in Fig. 4 has been ground a number of times. With an equal number of grindings the roughing tool would assume a similar shape, in the relation of the nose of the tool to the body. Tools should leave the smithshop with approximately the same angles as the finished tools are to have, to avoid waste on the emery wheel. Forging temperatures for most high-speed steels lie between 1,750 and 1,850 degree F. (yellow heat). During forging operations the temperature should not be allowed to drop to less than 1,600 degrees F. (light cherry or red). In Figs. 1 and 4 the noses are shown dressed straight with the body of the tool. For greater facility, when machining small castings, it is good practice to turn the nose of the tool to the right through an angle of 45 degrees from a plane parallel to the side of the body of the tool.

Hardening and Tempering

On account of the toughness of cast monel, it is very essential that the high-speed tool steels used in machining should be tempered or toughened after initial hardening. With one particular steel, namely Maximum 000L, excellent results were obtained with the following heat treatment. The temperature was slowly raised to 1,800 degrees F. (yellow heat) and then quickly to 2,300 degrees F. (white heat) and the tool cooled by

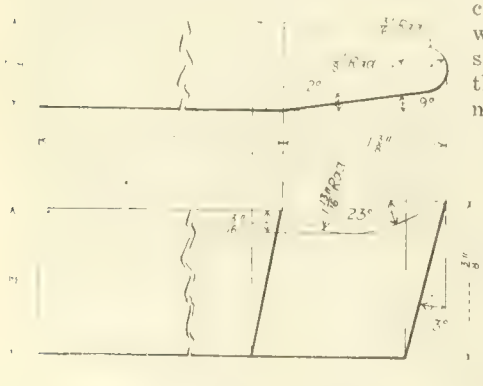


FIG. 1. DETAIL OF LATHE TURNING TOOL.

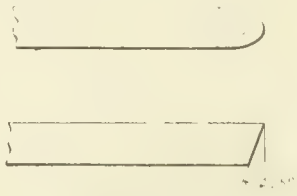


FIG. 2

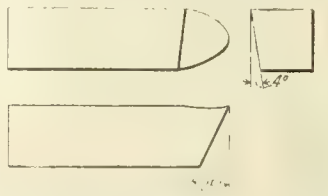


FIG. 3

FIG. 2. A ⅜-IN. ROUGHING TOOLBIT.
FIG. 3. A ⅝-IN. ROUGHING TOOLBIT.

lunging it into fish oil. The temper as then drawn at 1,000 degrees F. dark red), the tool being allowed to ool slowly in a closed box. Tempering he tool relieves the strains in the metal. iving it a tough rather than a hard utting surface and materially lessens he number of regrindings necessary for given amount of work. This hardening rocedure follows the general course as aid down for the majority of high-speed teels.

Among the high-speed steels which ave given satisfaction in cutting cast onel metal are the Maximum 000L, eter A. Frassee and Co.; Triple Mushet, . M. Jones and Co., and Rex AA, Cruble Steel Co. of America.

Grinding Tools

The tool should first be ground on a ry emery wheel, not being held firmly gainst the wheel but moved over its urface. The wire edge should be reoved on either a common wet grindtone or an oilstone. Care should be aken not to burn the cutting edges. The ides of the flank should be ground first, hen the tip or rake angle, and finally the dge should be rounded. On subsequent rindings, approximately the same ngles should be retained.

Feeds as shown in the table are recmmended. These figures are based on he experiences of a large number of rms. They are for dry cutting. Cooling olution permits the use of higher surace speeds. It will be noticed that a ood average speed of 60 inches per inute, ⅛-inch cut and 1-32-inch feed hould be used. To secure a better finhed surface, a light cut may be taken ith small feed and high speed.

The tool should have a true solid bearng on the tool support, which should exend as nearly as possible to a point dirctly beneath the cutting edge. The ody of the tool should be greater in eight than in width. The cutting edge hould be set slightly higher than the enter of the work to obtain the greatest

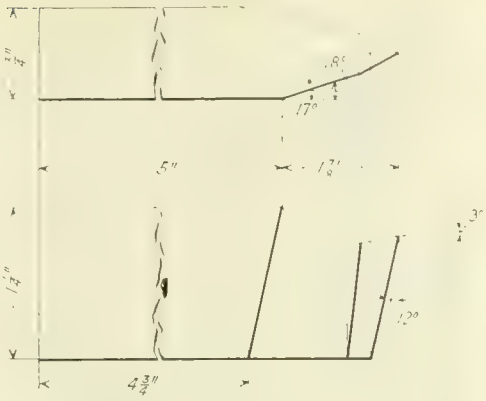


FIG. 4.—DETAIL OF THREADING TOOL SHAPE

shearing effect. No hard-and-fast rule can be laid down, as this height will differ with varying diameters. On small work where a full cut must be taken, with the danger of a dog or chuck interfering with tool carriage before its completion, the roughing tool may be set on an angle up to 30 degrees. For threading all the way to chuck or dog, a threading tool dressed with nose offset should be used.

Feeds and Speeds for Turning

Cut-inches	Feed-inches	Cutting speed Feet per minute
1/64	1/64	150
	1/32	120
1/32	1/64	100
	1/32	90
	1/16	75
1/16	1/64	85
	1/32	70
	1/16	50
1/8	1/64	75
	1/32	60
	1/16	45
	1/8	40
1/4	1/32	50
	1/16	40
	1/8	30

Lubricants

For ordinary lathe work, cast monel metal may be cut dry very satisfactorily. The use of a lubricant is sometimes preferable. Among those on the market that have been found to give excellent results are: For cutting, Houghtons' Soluble Oil, 1 gallon to 10 gallons of water, E. F. Houghton & Co.; Equinox No. 1, Lindsay McMillan Co.; Oakite, Oakley Chemical Co. For threading, Cresol No. 1 Soluble Oil, emulsion of 15 parts water to 1 part Cresol No. 1. For cutting and threading, Top Cutting Oil, Frontier Manufacturing Co. For general work, machine oil.

Examples of Work Done

In Figs. 5 and 6 are illustrated the turning operation on monel metal plugs which have successfully replaced bronze plugs, in connection with Burton's gasoline stills used in the petroleum refining process. The two machining operations necessary, turning to size and threading, are done on an engine lathe. The plug casting is gripped on the square head by a 4-jaw chuck. The tool is turned sidewise at an angle of 30 degrees to prevent interference of chuck and carriage. There is little tendency to dig in, and a wide, tapered chip is removed, thinnest at the finishing point.

A ⅛-inch cut is taken with 1-32-inch feed at 60 surface feet per minute. The point of the tool is set ⅛ inch higher than the center of the work, to obtain the maximum shearing effect. A cut of this size is, in most cases, sufficient to allow the cutting edge of the tool to penetrate under the tough skin of the casting, into the more uniform metal underneath.

The great advantage of the top rake in the lip surface of tools is clearly shown in Figs. 5 and 6. The chip is curled and thrown to one side with the least injury to the cutting edge. Keenness of the cutting edge is thus retained over the longest period of time with resultant good surfacing.

For the threading operation a tool with the nose turned to the right at an angle of 45 degrees is used. The finished thread is completed in three or four passes. The chip curls up very much as does the chip from the roughing tool.

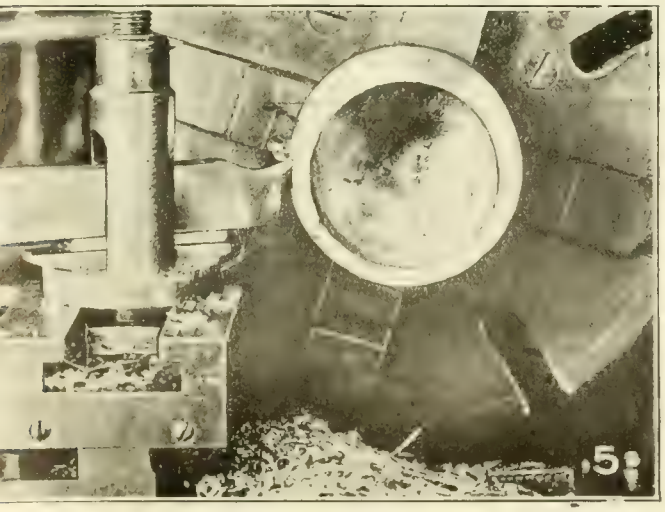


FIG. 5.—FRONT VIEW OF MONEL METAL PLUG BEING MACHINED ON ENGINE LATHE.

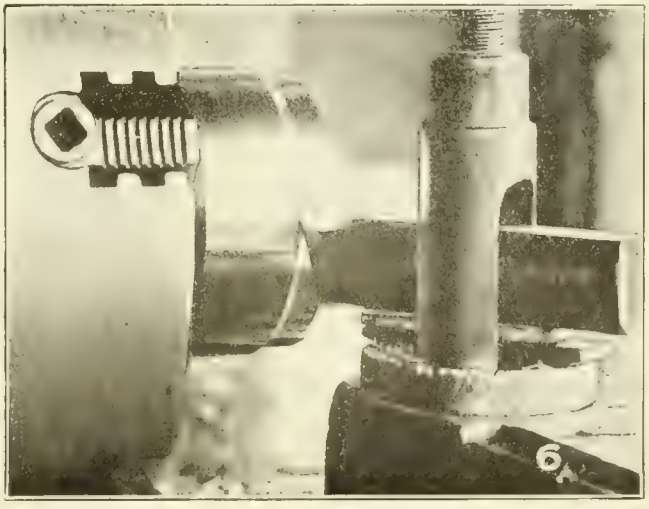


FIG. 6.—SIDE VIEW OF THE PLUG BEING TURNED.

Renewal of Cylinder Parts on Locomotives

Various Mechanical Tests Made on Cast Iron Such as Used for the Various Cylinder Parts—Traverse, Tension and Brinell Tests, With Their Results

By C. H. STRAND

THE RENEWAL of cylinder parts on locomotives has always been a sore spot in the side of railroad executives. The maintenance cost has been a considerable item. For this reason, if for no other, this portion of Technologic Paper No. 172 of the Bureau of Standards, Washington, D. C., should be interesting.

At the request of the former U. S. railroad administration, the bureau of standards has investigated the mechanical, chemical and microscopical properties of a number of packing rings furnished with service-mileage records, as well as arbitration-test bars, chill-test specimens, and miscellaneous samples from different manufacturers. All of this material was cast iron such as used for the various cylinder parts. It was desired at the same time to review the previous work and specifications on this subject, to ascertain as far as possible the practices of the different foundries and to suggest such revision of existing specifications as would be warranted by the results of the present and of earlier investigations.

The samples, 131 in number, were furnished to the Bureau of Standards by the U. S. Railroad Administration. The first samples were received April 2, 1919, and the last September 26, 1919, nine foundries supplying specimens.

Mechanical Tests

The mechanical tests made at the Bureau of Standards consisted of transverse, tension, hardness, and fracture tests of chill-test specimens.

Transverse Tests.—Thirty-four arbitration bars, ordered made in accordance with the standards of the American Society for Testing Materials, from six different manufacturers, were tested.

When the packing rings furnished were sufficiently large in size, specimens for small transverse tests were machined from them also. It is not to be expected that these results will be similar to those on unmachined arbitration bars, because of the absence of skin or surface hardness.

Tension Tests.—After breaking the arbitration bars in the transverse tests, the broken pieces were used to determine the tensile strength of the material. Tension tests were made from packing rings furnished by four foundries. From the tension tests, at least, there appears to be some more or less definite relation between laboratory and service tests.

Brinell Hardness Tests.—Brinell hardness tests, using a 10-mm. ball with a pressure of 3,000 kg., sustained for 30 seconds, were made on flat, longitudinal sections of the arbitration bars. Approximately ¼ in. of material was removed by the shaper to obtain a surface for the Brinell tests. As there is a variation of only 10 points from the maximum to minimum hardness, it is concluded that, in view of the widely varying quality of the irons as indicated by other tests, the Brinell test does not satisfactorily measure the quality of iron for cylinder parts.

The Brinell hardness tests of packing rings and bushings indicate that the castings themselves are considerably softer than the arbitration bars. This is undoubtedly due to the fact that the slower rate of cooling of the former results in a higher graphitic carbon content.

Chill Tests.—Chill-test specimens were received from four foundries and broken at the Bureau of Standards, four to six samples of the product of each foundry having been submitted.

Chemical Analysis

Chemical analyses were made of one of each of the arbitration bars from each of six foundries. The various bars were quite uniform in total, graphitic, and combined carbon content. The silicon and sulphur contents, however, varied within rather wide limits, the former from 1 per cent. to 1.47 per cent. and the latter from 0.051 per cent. to 0.167 per cent. The phosphorus content varied from 0.37 to 0.56 per cent.; manganese from 0.36 to 0.90 per cent. It is generally recognized that there should be at least three times the percentage of manganese as sulphur present; otherwise, sulphur will combine with iron instead of manganese, and brittle material will result.

In general, the silicon, and naturally the graphitic carbon is higher in the packing rings, bushings, and similar castings than in the arbitration bars. A ring which gave 93,000 miles in service showed no unusual characteristics in chemical composition.

Metallographic Examination

The samples were polished and examined microscopically both before and after etching. Heat tinting was found to be very suitable for revealing the irregularly shaped masses of phosphide eutectic and at the same time allowing the black flakes of graphite to stand out clearly. Micrographs were taken only of typical samples selected for purposes of illustration.

Some attempt was made to correlate the microstructure with the endurance in service, but, due to the many variable factors, it was realized that any very close comparisons were apt to be misleading. The inhomogeneity of cast iron made it somewhat doubtful that the small sample used for metallographic examination was representative of the whole. In some instances, however, with the aid of the principles governing the constitution of gray cast iron, the samples could be approximately classified, and the service records bore out fairly well the predictions that could be made of mechanical qualities from a study of the microstructure.

The microscope is most useful in determining the size, amount and distribution of graphite flakes, amount of combined carbon, and to some extent the physical soundness of the castings.

Conclusions are drawn and recommendations made as follows:

On the basis of test made by inspectors of the U. S. Railroad Administration and of the Bureau, which were substantially in agreement, it is concluded that air furnace or so-called "gun iron" is more uniform in character and on the average of somewhat better mechanical properties than cupola iron. The latter, however, often equals or even excels in mechanical properties the specimens of air furnace iron tested in this investigation. The sulphur content of the air furnace iron examined seldom exceeded 0.06 per cent., while the cupola iron varied in sulphur content from 0.10 to 0.17 per cent.

It was impossible, except in a very general way, to find any correlation between the quality of the iron as developed by laboratory tests and the mileage obtained in service. This is explained by the fact that many other factors besides the quality of the iron enter into consideration in the service results, namely, design, lubrication, method of handling the locomotive, topography of the country, character of water used in the locomotive, etc. It is for the reasons cited above that the conclusions and recommendations of this paper are based essentially upon the results of laboratory tests.

The present specifications of the American Railway Master Mechanics' Association are somewhat lax in the requirements for mechanical properties. It

is recommended that the transverse-strength requirements of a 1¼-in. arbitration bar on supports 12 in. apart be increased from 3,200 to 3,500 lb. for castings ½ in. or less in thickness, and from 3,500 to 3,800 pounds for castings over ½ in. in thickness. It is further recommended that the minimum deflection requirements for both cases be increased from 0.09 to 0.11 in. The rate of application of the load shall be from 20 to 40 seconds for a deflection of 0.01 in. The division line of the casting thickness is changed from ⅝ in. of the American Railway Master Mechanics' Association, to ½ in. in order to conform to the recognized standards of the American Society for Testing Materials. Two arbitration-test bars, cast as specified, should be poured from each ladle used for one or more castings.

Composition Recommendations

It is preferable to leave the chemical composition and the melting process used to the manufacturer, depending for the most part on the mechanical tests, and of these primarily upon the transverse test. The existing specifications allow a maximum of 0.70 per cent. phosphorus and 0.12 per cent. sulphur; there are no developments in this investigation which would warrant a revision of the maximum permissible amounts of these elements.

For the chill test a sample of the iron shall be taken before pouring and chilled in a cast-iron mold. The sample shall be allowed to cool in the mold until it is dark red or almost black, when it may be knocked out and quenched in water. On being broken, it must show a close-grained gray iron, with a well-defined border of white iron at the bottom of the fracture. The depth of the white iron must not be less than 1-16 in. as measured at the center line, for castings ½ in. or less in thickness, nor less than ⅛ in. for castings over ½ in. in thickness. One chill test shall be poured from each ladle of metal used for one or more castings. The specimens may be cast in adjacent molds, but in such cases a space must be provided between the molds.

Castings shall, of course, be smooth, well cleaned, free from shrinkage cracks and from other defects sufficiently extensive to impair their value, and must finish to blueprint size.

The purchaser, or his inspector, shall be given a reasonable opportunity to witness the pouring of the castings and test specimens, as well as to be present when the mechanical tests are made. Inspection shall be made at the place of manufacture, and the manufacturer shall also furnish the facilities for making the mechanical tests, if desired.

SUBSTITUTES FOR BRONZES

The shortage of many metals in Germany during the war period forced German manufacturers to adopt various substitutes. These are discussed in an article in a recent issue of "Stahl und Eisen," and translated in the "Journal of the American Society of Mechanical Engineers."

Crankshaft housings for submarine engines have to be built of a special bronze having very high mechanical qualities, such as high tensile strength and high percentage of elongation. Since the beginning of 1915, due to the shortage of metals, these crankshaft housings were made of cast steel, which did not lead to any particular difficulties, and, indeed, with the construction of larger sizes of submarine engines, proved to be an advantage, as it gave to the housing a greater rigidity. On the other hand, the machinability of the material was not so good as that of bronze.

All the screws, bushings, etc., which before the war were made of bronze or copper castings, had to be of iron and tin-coated in order to protect them against rust. This was done by the Schoop process. On the other hand, parts which used to be made of aluminum castings were during the war made of thin sheet iron and then galvanized.

Considerable trouble was experienced with piping. The former copper piping was replaced by steel piping, galvanized inside and out. The zinc coating did not prove satisfactory, however, as it was rapidly eaten away by sea-water and salty sea air. The pipes then were protected by lead, which, however, did not adhere well to the steel, and chipped off easily under mechanical influences. It therefore proved necessary to protect the piping by two coats of metal—zinc first and lead afterwards. This required great skill in manufacture, and a close control of the temperatures at which the metals were applied, and was therefore not wholly successful.

Vigorous efforts were made to conserve tin. Bronze bushings or parts under heavy stress (such as steering gears) used to be made of a bronze with a 15.5% tin content. During the war these bronze bushings were made of an alloy containing about one-third less tin and were not cast in sand, but in a metal mold so as to give them a greater hardness. This was based on investigations made in 1910 by Heyn and Bauer, which indicated that the hardness of a copper-tin alloy is really a matter that may be controlled either by variation in tin content, or by the proper control of temperature conditions during cooling, and, in particular, by the velocity of cooling. It should clearly be borne in mind that this hardening by rapid cooling is possible only with bronze, and not with brasses.

Bronze bushings with a tin content of 10% were machined, and after having been set in their seats were hardened on their surfaces by having a mandrel driven in under high hydraulic pressure. Parts not subject to heavy stresses were made of zinc castings, and it appears that the strength of such parts was materially affected by the heat treatment to which they were subjected.

An effort was made to produce a bearing metal containing 42% tin, 42% lead, 2% copper, and 14% antimony, but it has not as yet been carried to a successful conclusion.

Considerable trouble was experienced in attempts to find suitable metals for use in nozzles through which water, steam, gases, or acids are discharged under pressure. Here, in addition to other conditions, the tendency to corrosion and erosion had to be met. In particular, in injectors attempts were made to substitute cast-iron nozzles for bronze, but it was found that the former did not stand up well when used with either steam or hot water. The inner wall of the nozzle was strongly corroded, which interfered with the efficiency of the apparatus.

GRADUATES TAKE NOTICE

A rather interesting booklet entitled "A Few Brown & Sharpe Graduates" has just been issued by the Brown & Sharpe Manufacturing Company, Providence, R.I. The contents are especially interesting because an attempt has been made to compile a list of names of men who have served an apprenticeship at the Brown & Sharpe plant, these men having become graduates. This concern hope to make their list still more complete, and request that any man throughout the country, who served his apprenticeship with them, send in his name and address direct to their office at Providence.

This concern takes a very justifiable pride in its apprentice system, and states that out of an organization of over 7,000 people, the executives, with few exceptions, were formerly apprentices.

DRILLING HOLES IN GLASS

You can drill small holes in glass with a diamond point resembling that used for china riveting, or with a dead hard steel drill, says Practical Engineer. Use a lubricant of turpentine or oil of spike. Large holes can be rapidly made with a piece of copper tube having a serrated edge fitted with crystals of carborundum. It is not the hardness of the glass that causes the trouble, but the heat created by the friction of the drill. It will be found preferable to leave the glass in cold water where the experiment can be carried on, the water preventing undue heating with the consequent fracture of the glass.

WELDING AND CUTTING

Cast Iron Cutting With the Oxweld Blowpipe

Instructions For Cutting Cast Iron—How to Cut Poor Grades of Cast Iron, Also Good Grades—General Instructional Data for the Operator

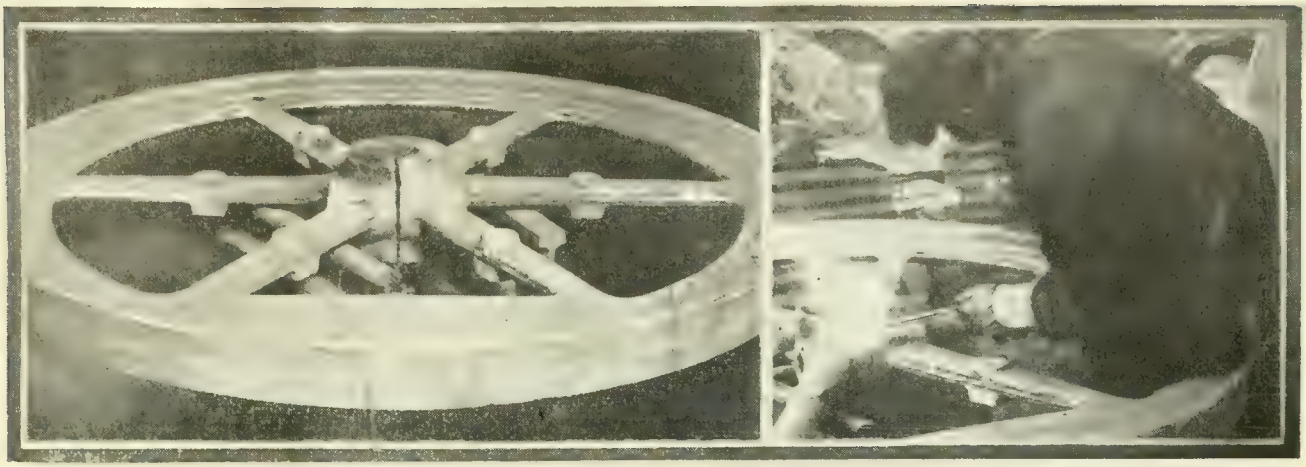
INSOFAR as their experience has been given to the public, the findings of the investigators in the field of cast iron cutting agree in indicating that, where pressure blowpipes are employed, some supplementary or specially designed mechanical part is essential. In one instance it is an attachment for preheating the oxygen; in another, a specially constructed tip. According to the Oxweld Acetylene Company, Newark, N. J., and Chicago, their experience seems to have demonstrated to them that general service cutting blowpipes of the injector type require no special attachments, no alteration of the stock torch being necessary because of the solid stream cutting jet and the long preheating jets, which converge toward and are drawn down into the cutting by the cutting jet, thus intensifying the temperature to a point where a special device for preheating the oxygen or a special tip is not necessary to propagate the cut.

According to them the reason blowpipes have not accomplished this work, excepting where specially designed for it, is that it has been impossible to adjust general service blowpipes of that type to give strong flames carrying the necessary excess of acetylene. With some pressure blowpipes fairly good flames have been obtained, and with them it might be possible for a very skilled operator to gradually obtain a cut through the metal, but undoubtedly the operator would take a long time and a real cut would not be obtained.

The Oxweld blowpipe was not originally designed with a view to cutting cast iron, but, after exhausive experiments, a method of operating the torch in cast iron cutting was developed, and it can be mastered by the average operator almost as easily as the method employed for the cutting of steel. There is, however, a decided difference in respect to procedure. In practice, cast iron cutting with the Oxweld blowpipe differs from steel cutting in that: It is necessary to use heating flames having an excess of acetylene; second, it is necessary to hold the blowpipe nozzle farther away from the metal, and third, it is necessary to preheat for a longer period for cast iron than for steel, since the cast iron must be almost molten before the cutting reaction will start. Steel ignites at a temperature well below its melting point. Lastly, it is necessary to continually oscillate the nozzle to maintain the cut. A cast iron cut, if properly handled, and if the material is of good quality, will have an appearance about equal to that of a fair cut in steel.

The time required for cutting a given section of cast iron is about twice that

THIS SIXTEEN-TON CAST IRON MELTING POT WAS CUT IN TWO HOURS, THIRTY-FIVE MINUTES. THE POT WAS 12 FT. DIAMETER, AND HAD A FLANGE 1 FOOT. WIDE AT THE TOP. THE CUT MADE WAS SEVENTEEN FEET LONG.



TWO VIEWS OF WHAT CAN BE ACCOMPLISHED WITH THE TORCH ON FLYWHEELS.

required for cutting a similar section of steel. This makes the cost considerably higher in the instance of cast iron, and tends to restrict its application in many places where one might suppose it would be generally useful. For example, the inexpensive methods employed for removing risers from castings in iron foundries preclude the use of oxy-acetylene as an economical means of performing this class of work. Further, the cutting off of risers from chilled iron castings is usually not practical because the surfaces cut are likely to crack or check, due to local heating.

The use of cast iron cutting is, however, being appreciated in the steel mills, where it was introduced more than a year ago. In those plants its demonstration was received enthusiastically, and cast iron cutting has since been used daily in that and other industries for removing broken machinery parts such as pinions, gears, fly-wheels, housings, etc. The removal of such parts by old methods usually required several days because of frozen shafts, bolts, etc. With the cutting blowpipe the broken part, and sometimes parts adjacent to it, are cut quickly, the parts removed, repaired, or new parts installed, all within a few hours.

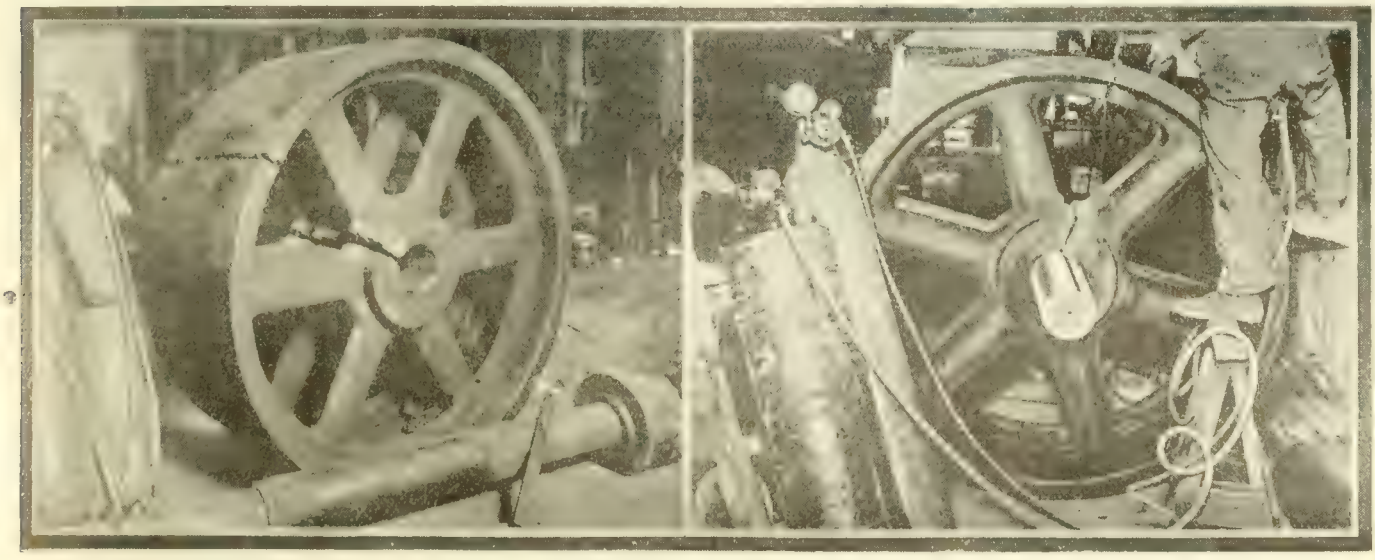
Instructions for Cutting Cast Iron

The blowpipe manipulations for cutting good grades of cast iron and for cutting poor grades of cast iron are quite different, and are both described below. Although there is a difference in the manipulation of the blowpipe, the oxygen pressures used and the adjustment of the flame are the same for both grades of metal.

In cutting good grades of cast iron first adjust the oxygen cutting regulator to give the correct pressure as shown in the cast iron cutting chart for the work to be done, having the blowpipe cutting valve open. Then close cutting valve. Next open oxygen valve one-half turn, and acetylene valve fully, and light blowpipe. Open cutting valve and adjust acetylene valve to give flames having an excess of acetylene and of the length shown in the cutting chart. Then close cutting valve.

The third step is to hold the blowpipe so that the nozzle points backward at an angle of 45 deg., with the inner cones (not the excess cones) ⅛ inch to ¼ inch above the surface. Give the nozzle a swinging motion describing semi-circles over the end of the line of cutting and heat a semi-circular area about ½ inch to ¾ inch diameter to a bright cherry.

Next move nozzle just off the heated edge, open cutting valve quickly and move nozzle (at 45 deg.) forward along the line of the cut with the same swinging motion. While advancing the nozzle, gradually straighten it up so that it is about 75 deg. pointing backward when at the inner edge of the previously heated semi-circular area. After this advance nozzle about ¼ inch to burn off the molten surface, then quickly move it backward to burn through the comparatively dark layer and lower section, then hold it steady for a moment to heat the upper surface. This movement can be best practised by counting as follows: 1 forward, 2 back, 3 hold; 1 forward, 2 back, 3 hold, etc.,



THESE TWO VIEWS SHOW HOW A LARGE PULLEY WAS CUT IN ORDER TO REMOVE AND PRESERVE A FROZEN SHAFT. NOTE THAT THE SHAFT IS IN PERFECT CONDITION.

GENERAL VIEW OF THE POT SHOWN IN OTHER VIEWS.

etc. Continue moving nozzle in this manner at the rate of about one complete cycle per second. When the far edge is reached, carry nozzle over the edge and across the other surface, holding it at about the angle of the lag, and cut through the lag section.

Method for Cutting Poor Grades of Cast Iron

Follow the directions given for cutting good grey iron, except that instead of using the peculiar motion explained, advance the nozzle slowly, describing semi-circles from about ¼ inch to ½ inch wide across the line of the cut, holding the blow pipe at about 75 deg. pointing backward.

In cutting cast iron, a dark layer will be found extending down from the top surface about 1 inch to 1½ inch. Below that layer the material will be bright, having an appearance about the same as steel. Be sure that the forward and backward or the semi-circular movement of the nozzle allows the blowpipe to cut almost perpendicularly through the dark layer. The lag must not start until below that section. Particular attention must be paid to this condition.

If cut is lost, move nozzle back along one edge of the kerf about ½ inch and describe semi-circles lapping that edge and that point where the cut stopped. It the cut is not readily resumed, carry the semi-circles over to include both edges of the cut and the point where the cut stopped. Always wear heavy asbestos gloves and suitable clothing to the body, face and head, because cast iron cutting is a very much hotter operation than steel cutting. Always make sure of ample protection from the heat before starting so that it will not be necessary to stop the cutting operation to take shelter or provide further protection.

There has been no more interesting recent development in the oxy-acetylene field of research than the successful application of oxygen to the cutting of cast iron. Curiously enough this old enigma of the industry appears to have been solved contemporaneously, if not concurrently, by separate investigators and in entirely different ways. Following publication of instructional data in March of the present year, the Oxweld Acetylene Company staged a demonstration of cast iron cutting for the edification of its employees. This demonstration was held in April and was intended to be a strictly private affair; but, through a betrayal of confidence on the part of a photographer, prints of pictures taken at the time were sold to the newspapers and appeared in rotogravure in the Sunday issues. A month or more after this there appeared the first of several articles on this subject. At the present stage of development cast iron cutting may be accepted as an established fact, but not as a concluded study, and the future may be looked to with every confidence that it will yield much of interest and value in the general direction of increased economy and practical utility of the process.

CAST IRON CUTTING CHART

Size of Nozzle	Thickness of Metal. In.	Oxygen Pressure Lbs. sq. in.	Length of Excess Acetylene In.
	½	45	
	¾	50	
	1	55	
No. 3	1¼	60	1 to 1½
	1½	65	
	1¾	70	
	2	75	
	3	85	
	4	95	
	5	105	
No. 4	6	115	1 to 2
	8	125	
	10	155	
	12	175	

This chart shows about the same gas values recently published by other investigators in the cast iron cutting field.

FUELS ON RAILWAYS

Important trials with pulverized coal and "colloidal fuels" have been carried on the Great Cental Railway, England. Colloidal fuel is powdered fuel suspended in thick oil, and pulverized coal is dry coal reduced to a fine dust. The trials, which were made in comparison with ordinary coal, showed that the special fuels could easily maintain a full head of steam with a high degree of superheat, even on heavy gradients and sharp curves. Locomotives adapted for burning pulverized coal or colloidal fuel show an economical freedom from ash-pan cleaning, smoke-box cleaning and repairs, fire cleaning, and so on. Further, when the locomotive is delayed in a siding there is much less waste of fuel than in the case of ordinary engines.

ELECTRO-PERCUSSIVE WELDING

In a paper recently presented at a meeting of the Pittsburgh section of the American Welding Society, Mr. D. F. Miner, the author, discusses recent development in electro-percussive welding. This form of welding is a process which is primarily intended for manufacturing applications, where large quantities of duplicate parts are to be produced. The apparatus in its earlier form utilized the electric discharge from an electrolytic condenser consisting of aluminum plates immersed in an electrolyte of borax solution. A scheme has now been evolved for utilizing electrical energy stored in a magnetic field, thus substituting electro-magnetic energy for electro-static, and welds of the butt type up to a cross-sectional area equivalent to ½ in. diameter stock have been successfully made. The complete operation occupies about 0.1 second of time, giving no time for oxidation or excessive heating. The time sequence of events shown in an oscillogram taken during a weld between ⅜ in. copper and steel rod indicates a peak of current of 2600 amperes, an arc voltage of 30, maximum power 60 kilowatts, energy 0.00077 kilowatt-hours, and time 0.094 sec.

Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.

The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

There is no prize-winner for the January 6th contest. Although we received as many answers as before, not one list was correct. Only one reader guessed query No. 10, yet the answer to the query is found in the first paragraph in the advertisement. Two scales will be given next week, in place of one, to make up for this condition.

CONTEST FOR JANUARY 27TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1—Something that is said to always have been one of the fundamental tools of industry.
2—That if you have an idea it pays to tell about it, especially if you prepare it in a certain form.
3—How to prevent a serious loss in dollars.
4—How to save time, grinding wheels and high speed steel.
5—Something that is said to save money every day it is used.
6—How to learn details about repair work.
7—Something said to be proof against trouble.
8—How to prevent corrosion.
9—Something profitable for both parties.
10—A product said to give absolute accuracy.
11—How to determine your production.
12—A suggestion worth considering.

These are Correct Answers for List from January 6th Issue:

1—Heald Machine Co.
2—Brown & Sharpe Mfg. Co.
3—Gisholt Machine Co.
4—Roelofson Machine & Tool Co.
5—Clipper Belt Lacer Co.
6—Canadian Ingersoll-Rand Co.
7—Landis Machine Co.
8—Modern Tool Co.
9—Wisconsin Electric Co.
10—Canadian Driver-Harris Co.
11—Cataract Refining Co.
12—Armstrong Bros. Tool Co.

Closing Date for This Contest is February 17th

DEVELOPMENTS IN SHOP EQUIPMENT

CONTINUOUS MILLER

The Davis & Thompson Co., Milwaukee, Wis., have placed on the market a continuous milling machine that is designed for milling such work as cam shafts, crank shafts, worm shafts, transmission shafts, automobile axles, and any forgings that require milling to length. The machines can also be used for milling small castings such as sad irons, tractor and automobile parts.

As can be noted by the illustration there are two gear housings.

In each gear housing are two spindles which have a micrometer adjustment endwise of 2 inches. This has a locking arrangement to lock the spindles in place after setting to the desired location. These cutter spindles have opposed cone bearings. The right-hand head is adjustable on the bed, the same as a tail-stock on a lathe, and is held by clamps on the bottom of the head, clamping the head to the ways of the machine. This permits milling to length various sizes up to the capacity of the machine. The machine has a single pulley drive and has two changes of speed.

The work mandrel which is supported in each of the gear heads, or spindle housings, is rotated by a bronze worm wheel and hardened steel worm. The different feeds are accomplished by change gears which are located at the back of the machine, and the feed is engaged by cone friction. The lower gear housing which encloses the speed gears is an oil-tight compartment and is filled with transmission oil which insures lubrication to all bearings and gears, while the lubrication is taken care of in the gear heads, or spindle housings, by a large oil reservoir inside of the housing, and the gears run in a bath of oil.

The machine is made to take any desired length within the capacity of machine between the cutters. The fixtures which are made in halves, clamped and keyed to the work mandrel, can be removed very easily. A set of fixtures is made to take each individual class of work to be done on the machine.

In some cases a set of clamps are provided, one clamp holding down two shafts, as shown in the photograph of machine arranged for milling worm shafts, while in a great many cases the machine is equipped with the automatic clamping apparatus for holding round work, small castings, etc.

This apparatus as shown in the other view consists of an endless wire cable affair, having two or more cables. The cable is kept taut by the large tension spring shown, and with this arrangement the production on machine is increased, as all the operator has to do is to drop the pieces in the notched jigs, and pick them up as they come around after being milled.

These pieces pass underneath the cable as the table rotates, bringing the work in contact with and by the cutters. This machine has a roughing and finishing cutter which allows the use of a very stiff feed, and the finishing cutter is said to give a good finish even with coarse feed.

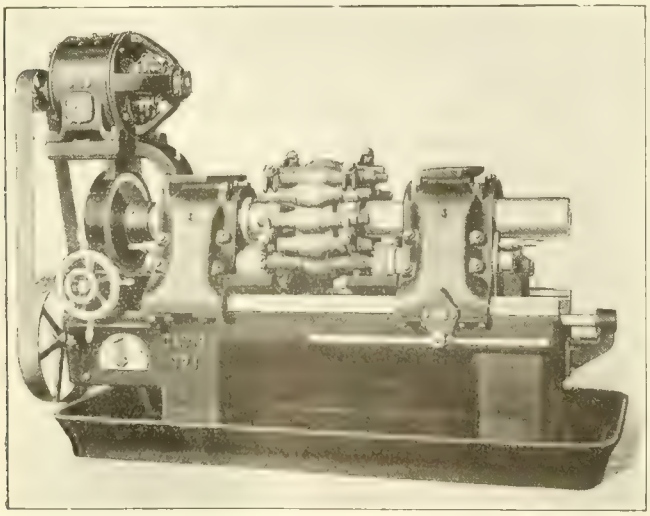
When milling castings with the cable arrangement, it is sometimes necessary to make a jaw receptacle for holding castings in place which insures a good path for the cable to travel in, and which will prevent acute bends in the cable. These cables move possibly 20 inches per minute.

PNEUMATIC ROD CUTTER

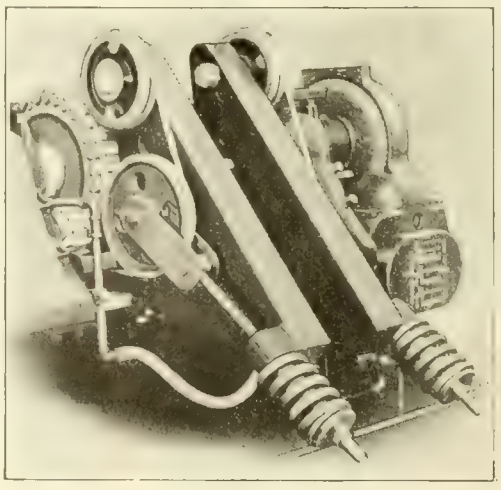
The Scully-Jones Co., Chicago, Ill, have developed a line of pneumatic rod cutters that will cut all sizes of rod within their range, without any change or adjustment. The machine is operated at a minimum of 60 pounds air pressure.

It is said to be impossible to break the machine while operating, as it is strong enough to withstand any strain put upon it in shearing rods. The only moving part is the knee-pad, so that no injury to workman is possible.

There is practically no expense of upkeep, as the only parts that can wear are the cutters. These are round ring cutters, and as they wear, they can be turned around so as to give each cutter ten new cutting edges. The amount of air consumed in operation is negligible, as travel of piston in the ⅜-inch machine is only ½-inch, and the ⅝-inch machine is only ⅞-inch. Machines can be installed on permanent benches, or



GENERAL VIEW OF THE CONTINUOUS MILLER.



REAR VIEW OF THE FEEDING APPARATUS.

on portable benches on wheels. Air hose can then be run to the machine, enabling it to be taken right to the job.

These machines are adapted for use in all places where rod are cut, such as foundry core-rooms, machine shops, blacksmith shops, bedstead factories, steel mills and bolt factories. The machine will operate without any change, as well with steam as with air. It is made in two sizes, the small machine cutting from 0 up to ⅜-inch diameter, while the larger machine cuts from 0 up to ⅝-inch diameter.

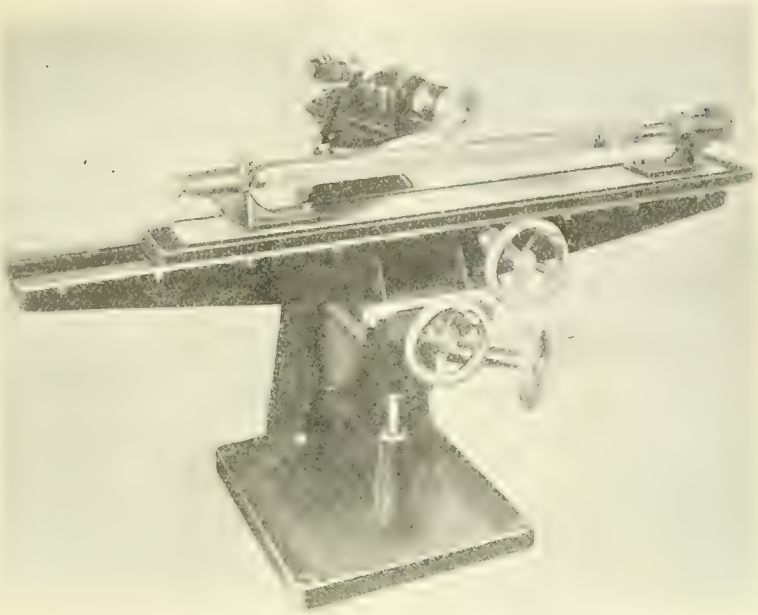
MANUFACTURING REAMER

That the Gisholt Machine Co., Madison, Wis., have placed on the market a new solid reamer that is adjustable sounds impossible, but here are the details.

The reamer is termed a manufacturing reamer and is made in three body types; the shell reamer, straight shank machine reamer, and taper shank machine reamer. In these bodies the various style blades are interchangeable.

The reamer bodies are made of special steel heat treated. They are milled with a suitable number of blade seats which are wide and comparatively shallow. The blades are of high speed steel accurately ground on the sides and bottom so they not only fit snugly in the blade seats, but are interchangeable. The blades are supported against end thrust by the reamer body itself. The two screws shown in illustration only retain the blade in the slot, and do not take any appreciable strain of the cut.

When worn below size the blades can be packed up with the tin foil underlay stock which is furnished. This adjustment may be repeated several times, and when the blades are finally worn out they may be replaced with new ones, making the reamer as good as new. This construction gives the reamer even more strength than a solid reamer of the same size, with all the advantages and economy gained by adjusting and renewing the blades. It also eliminates the danger of inaccuracy that exists whenever reamers which can be adjusted with a wrench are used on manufacturing work. Reamers of this latter type are frequently useful in the tool room or where a few holes must be specially reamed to fit shafts of varying sizes. On manufacturing work however, duplicate holes measuring within certain fixed limits are required, and as reaming is usually the last operation, the reamer must be depended upon to produce the desired size.



GENERAL VIEW OF THE MACHINE.

BROACH GRINDER

A single purpose grinder for the express work of sharpening broaches has recently been placed on the market by the J. N. Lapointe Company, New London, Connecticut. This grinder was originally designed and built a number of years ago for use in their own factory. Because of a demand from many users of broaching tools for a machine-tool to easily and accurately grind the small and varying angles of broach teeth, the machine is now being offered to the trade.

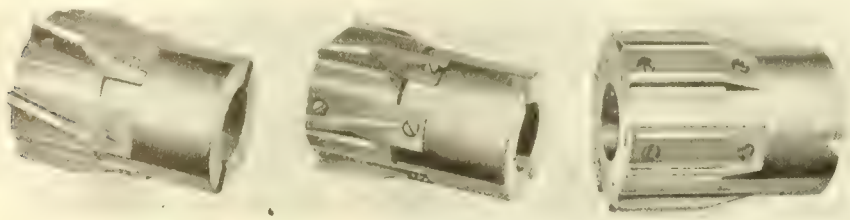
It consists of a solid column supporting a vertically adjustable knee. The knee carries a table of which both cross and longitudinal hand feeds are possible. The grinder is furnished with a head and foot-stock, which are mountable on the table for broach grinding and which are removable for the clamping of square broaches and keyway cutterbars. The head-stock is comprised of an index machanism for use when grinding spline broaches and a live center, which is belt-driven from an auxiliary countershaft. The auxiliary shaft is driven by belt off the main countershaft. A three step cone pulley on both shafts gives three possible speeds to the live center spindle on the grinder table.

The table is of sufficient dimensions to grind broaches 64″ long and 8″ in diameter. The sharpening of practically all broaching tools in industrial use is, therefore, within the capacity of the Lapointe grinder.

The grinding wheel itself is carried on a spindle supported by a swivel-head which makes it possible to both grind the rake angle on the back of the broach teeth and to undercut the faces. The head swings on the column of the machine to any horizontal angle and so permits the grinding of teeth machined to any angle to the axis of the broach as well as the grinding of teeth at the customary 90 degrees to the axis. The grinding wheel spindle is belt-driven from the main countershaft. A pair of idler pulleys change the direction of this belt for any angle of the grinding wheel spindle. The whole swivel head mechanism is moved forward and back by a hand lever to put the grinding wheel in contact with the broach teeth, and to remove it from contact. The machine occupies 39″ x 134″ of floor space when the table is extended and stands 47″ high.

MEASURING INSIDE DIAMETERS

A method of measuring the inside diameter of plain ring gauges has been developed by the United States Bureau of Standards, employing two steel balls the sum of whose diameters is slightly larger than the nominal inside diameter of the ring to be measured. The ring is laid on a surface plate and the larger ball placed in the ring; the smaller one then rests against the inside of the ring and on the larger ball. The difference in vertical position between the upper surfaces of the two balls is determined by means of a micrometer attachment. This dimension is easily converted into the vertical distance between the centres of the two balls. The value thus obtained forms one side of a right-angled triangle whose hypotenuse is the line joining the centres of the two balls and whose base it is desired to determine. Knowing the vertical side and the hypotenuse, it is possible to calculate the length of the base, which, added to the radii of the two balls, gives the inside diameter of the ring.



ILLUSTRATIONS OF THE THREE STYLES OF BLADES.

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Make the Most of It

THAT employers should try to make out of the present situation in industry conclusive proof that their men do not need added protection in the way of unions is an idea brought out by J. Harvey Williams, president of the J. H. Williams & Co., Brooklyn, and known better to this country through the company's plant at St. Catharines.

Mr. Williams, in a statement regarding labor conditions, makes it plain that he considers the retailer responsible for holding back from the consumer the benefit of reductions that have been made in the prices of commodities, and in this way making it harder to readjust wages.

Mr. Williams is right when he claims that the manner in which readjustments to new levels are made now will have much to do with future industrial relations, adding "for just as it is the reactionary employer of the past century who is chiefly responsible for the origin and growth of the pernicious features of some of the trades unions in this country to-day, so the employer of to-day by a liberal and just attitude has a greater opportunity than has ever been presented to him in recent years to demonstrate to his men by his acts and by his understanding that additional self-protection in times of prosperity is merely a waste of their hard-earned money—and that is what it should be if the spirit on both sides is right."

If an employee, now that work is scarce, and the advantage rests with the factory, has cause to feel that the screws are being clamped on him to the point of oppression—as a competent worker he is finished.

Henceforth he will have two jobs, one to make enough showing to hold on to what he has, and the second will be his preparation to hit back.

He will come to the conclusion that his safety lies in his membership in a union and not in the justice of his employer.

This is a lamentably poor time for employers, superintendents or those in charge of employment to be working out a long-nursed grudge.

You have heard it—something like this: "For the last five years the men have run this shop while I financed the thing. Now I am going to show them who's running this place."

Don't work along these lines. Remember paying up a back score is also determining the future atmosphere of your shop.

If your business has been very good during the last few years, let go of some of the surplus and provide as much work as possible.

If things are still going fairly well, don't be too keen to put the axe into the wage list.

The employer has a good chance now, even in times of uncertainty, to spike the guns of the labor agitator.

Canadian Machinery and Its Readers

CANADIAN MACHINERY has been running a series of questions recently with the idea of encouraging the reading of the advertising pages of this paper, and the results are away and beyond anything that could be hoped for. This week the first letter coming in was from Sydney, N.S., and the next was from Vancouver, B.C. Here are a list of places from which replies were received in the last few days, taken at random from the list: Villeray, Que.; Yarmouth, N.S.; Fredericton, N.B.; Welland, London, Lunenburg, N.S.; Sarnia, Chicoutimi, Que.; Edmonton, Winnipeg, St. John, N.B.; Niagara Falls, Hartford, Conn.; Euclid, Ohio; Kitchener, Prescott, New Liskeard, Copper Cliff, Guelph, Sault Ste. Marie, Port Hope, Brandon, Man.; Westville, N.S.; Toronto, Peterboro', Halifax, Sydney, Dundas, Penetanguishene, Kenora, Sycamore, Ill.; Hamilton, Montreal, Brantford, Gull Lake, Sask.; Rockford, Ill.; Woodstock, Sherbrooke, Port Arthur, Galt, St. Catharines, Cleveland, Ohio, Fergus and Elmira.

The answers show that readers are going very carefully into the matter, some of them often going to the trouble to point out that other ads. conform very closely to the ones mentioned in the list.

It proves beyond a doubt that the advertising pages of Canadian Machinery are being read very thoroughly by the mechanical world of the Dominion.

We have often been told by our readers that they found a great deal of useful information in the advertising pages, but the manner in which intelligent and carefully-worded replies are coming in from all corners of the Dominion and many times from mechanical points in United States, shows beyond doubt that readers are paying attention to the advertising pages of Canadian Machinery in an unusual way.

A Mechanical Wonder

THE Bell Telephone Co. are putting in a new pay-phone which hands the money back if the party calling fails to get service. It is an ingenious piece of mechanism and goes to furnish further proof that the world is indebted to the skilled mechanical mind and hand for many things.

This new machine should be built with a fairly strong digestive system, as past experience in pay-phones shows a crop of punctured coins, bogus money, buttons, washers, tobacco stamps and a steel washer that was much in evidence when airplanes were being made.

If this new machine can stomach all these missiles instead of honest-to-goodness money and still courteously hand out change to dissatisfied customers, it will be nothing short of mechanical conformity to the Golden Rule.

Just a Nasty Burn

ONLY a few days ago a workman from an outside plant was engaged to put something in order on a process where hot metal was in use.

Another workman carelessly dropped a block of metal in the melting pot. It was wet in spots with the result that a good-sized splash followed, in which the outsider had a nasty burn on his wrist.

He asked if there was a first aid box as he wanted to have the wound attended to at once. The answer was that the firm wasn't very strong on "this new-fangled stuff."

And so the mechanic had to do the best he could, working away with a nasty open burn on his wrist and in a place where he was apt to pick up something that might cause trouble afterward.

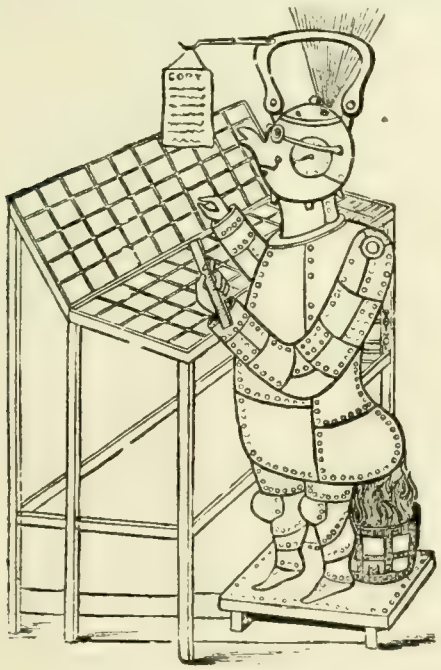
A little first-aid box is not in the "new-fangled" class. It is as necessary around the shop as an insurance policy, a cost system and a payroll.

And yet it is astounding to consider the number of fairly large firms where little attention is paid to this matter.

It Can't Be Done

WHY is it that so often a step in advance in any mechanical contrivance is heralded by a storm of "It can't be done" comment? It may be that there is not so much of this done now as some years ago, as we are now living in an age where mechanical ingenuity knows few limits.

But take the case of continuous feeding to an automatic machine as an example. The old method was to loosen the chuck, take out one piece and insert another and so on.



The old hands that attended to this considered that at times they could attain a speed that was pretty close to continuous feeding, but in reality it was a long way from it.

But the change came. Now the automatic has its magazine. The work is loaded in the magazine and is always kept loaded the same as a repeating rifle. As one piece is completed it drops out, falls down a chute into a box, while the other piece drops into place and is gripped by the chuck and machined.

The new order of things IS, while the old way WASN'T. On this page we have an example of so-called wit of years ago when the old-time printer was telling the world that there was no chance of any person ever building a machine that would set type. It used to run like this: "Imagine a machine that can walk around the office from one case to another and set type." There was always a good congregation for any such talkers and they would settle to their own satisfaction that the thing simply could not be done.

The artist in this case has been somewhat of a satirist and labelled his picture "The Great American Steam Type Setter." This was some fifty years ago. If this old boy could walk into any printing office to-day and watch the working of the linotype he would see where the "Impossible" chorus had been all wrong again. He would see one of the most complicated and yet one of the most possible machines ever turned out. He could at once recognize just what mechanical movements can be done with a properly timed set of cams. He would have seen also that he was on the wrong set of rails when he was spending his time in ridicule when others were spending their time in doing the thing.

This same thing is happening in every line and is not solely the child of the machine shop or of the mechanical world.

There are always plenty to view any situation, particularly if it is difficult and likely to call for extra exertion, and declare "It can't be done."

It does not require much courage to take this attitude —just a mental assent to an easily-arrived-at conclusion.

But some person is sure to come along sooner or later who has not been steeped in the "can't be done" brew and he goes ahead and does the thing.

Eureka! I Have Found It!

THE excitement appertaining to the fearful and wonderful adventures of the heroic balloonists having somewhat subsided, the enterprising representatives of the daily press have been forced to look around for something of interest for their readers.

The search has resulted in nothing less than the discovery of what electricity actually is. This is not the first time it has been discovered, for only recently we were regaled with the story of a twelve-year-old boy who ran a four and a half horse power motor boat engine for a number of miles without any fuel except the circumambient atmosphere.

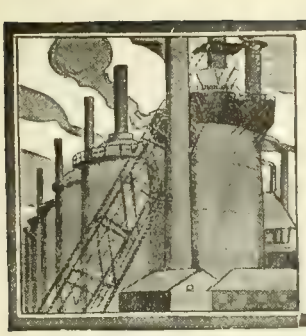
He explained that his real motive power was electricity drawn from the atmosphere.

Yes, just that. The present discoverer is said to be no less a person than Dr. Frederick Klein, a noted chemist and research worker in cancer problems. Dr. Klein explained his discovery to a reporter in the following simple language: "The average chemist and the average scientist figure on the bi-valency of oxygen and only lately has research proved that oxygen is also 4, 6 and 8 valent. It is in the valency of oxygen and its ratio that the possibilities lie for bigger things for the future."

Dr. Klein states that all that is required is for a group of varied scientific minds to be brought together and work out the remaining part of the problem and the question of light, heat and power is solved forever.

Coal will be an article only for exhibition in the museum. The ultimate consumer will have a storage tank on top of his garage, from which he will draw his supplies of power, heat and light for household use and motive power for Lizzie.

So far we have not noticed any serious drop in the price of coal, but we would advise any of our readers who have shares in collieries or the Standard Oil Company to get out while the getting is good. This is truly a wonderful age we live in.



MARKET DEVELOPMENTS

Very Little Change is Shown This Week

Prices in Several Lines in the Steel Market Are Lowered in the Warehouses—New York List Withdrawn Because Prices Were Considered Too High—One Dealer Looks For a Very Good Season's Business.

NOW and then one finds a dealer who has become an optimist. It is not claimed that this class is by any means large, but it is on the increase. A dealer handling supplies, new and used, for builders and contractors, reports that he is going to have the best season in his history.

There is more consistent work being done right now in the selling business than has been witnessed in the Canadian field for months, if not in years. Wherever there is any business showing up there is certain to be a small army of salesmen. A certain amount of hanging-fire business is being closed up in this way now. Prices of machine tools remain unchanged and a New York buyer having a fairly good list in the market withdrew it because the dealers had made no change in their prices. There are no indications that makers are going to depart from their present schedule of prices.

In this district there have been some reductions in the steel and iron warehouses. Sheets are down a little and there is a tendency to give pretty close prices on this item in order to get cleared out of present stocks. It cannot be claimed that there is anything in the nature of a price-cutting policy being carried out. Buying is still being done in very small quantities and stocks are very light in manufacturers' warehouses.

A certain amount of business is being given out by the automobile makers and the volume of this is likely to increase as time goes on. The principal thing, according to the trade, is that a start shall be made toward operating the plants.

The scrap metal trade is still very flat, but there seems to be a pretty well-grounded feeling that the bottom of the price list has been reached and that any kind of a buying movement would result in prices becoming firmer almost instantly.

LOOKING FORWARD TO BETTER CONDITIONS WHEN SPRING OPENS

Special to CANADIAN MACHINERY.

MONTREAL, Jan. 27.—The optimism that dominates nearly every phase of industrial activity is the one encouraging note that features trading at the present time. Some reports indicate a slight betterment in business carried on, but in general the different markets continue in a more or less listless condition, but with sufficient future inquiry to give the impression that early spring activities will be on a larger scale than those of the past few months. The tendency is shown in many quarters to establish new working conditions to better combat the declining prices on many staple commodities. Much of this is being done with the reluctant co-operation of workmen in the plants; yet, while realizing the necessity of meeting the manufacturers half-way, they are still confronted by the fact that many necessities of life are still at war levels, and in some cases even higher.

This fact tends to delay any marked improvement in general business conditions. "One of the essential factors," said a business man here, "in re-establishing a healthy state of commercial and industrial activity, is a more widespread recognition of the necessity of conforming with the needs of the time, in accepting some of the losses incidental to adjustment to lower levels in the cost of manufacture. Many merchants, in domestic lines, are still reluctant to dispose of stocks on a replacement basis and this attitude is extending the time when business will be returned to a normal footing. Of course, we steel interests are not affected, directly, by what transpires in the retail trade, but if individual buying is restricted, production is necessarily curtailed, and with factories operating light, their requirements are proportionately reduced."

Hard Work Selling Steel

Statements to steel dealers here are to the effect that business is proceeding quietly but showing no marked improvement. "We do not think that prices will recede much further as those now quoted are practically rock-bottom. There may be some slight reductions by independent producers, but not sufficient to have any material influence on the general situation. Railroads have been putting off buying, but it is expected that a change in this respect will soon take place and when the buying movement does commence the market will strengthen and prices become even firmer than they are at present." Speaking on the decline that has taken place on the English market, the dealer continued:

"Prices over there have been so much higher than those in the States that they can well afford to knock off considerable without in the least affecting the market here. For some time back, steel could be shipped from Pittsburgh and laid down in England at less than it could be purchased at English mills." Salesmen are having some strenuous times in persuading purchasing agents as to the advisability of buying now. Conservatism is still the policy of many consumers.

Special Efforts Produce Sales

"It is only by consistent efforts on the part of our salesmen that we can report a week of fair business. It has been shown that more energetic effort has resulted in slightly better business, but this does not signify that next week will give the same results, for buying without using only means that their stocks are increased that much. What is needed is greater activity, and it is only this that will assure a steady turnover. We are selling few heavy tools, the greater number of sales being in the smaller lines." This brief statement appears to be typical of machine tool conditions here. One dealer, who remarked that business was very quiet, stated that he had not received an order nor an inquiry for two consecutive days, and it was only the compiling of the stock inventory that kept them engaged. Despite this fact, however, they are looking forward to better business before the winter closes.

Old Material Still Inactive

Little can be said in favor of the old material situation, as business is more or less of a nominal character, with dealers going to their offices more as a matter of habit than for the transaction of business. It has come to the point where the dealers are as anxious to learn the trend of activity as any other person, for the usual greeting on entering the office is: "How do you find things yourself?" Mutual confidences usually dispel any pessimistic tendency, but throw little light on what will develop in the immediate future. "As regards prices," said a dealer, "it is difficult to give definite quotations as these will vary according to the sale, but those you are quoting are, on the whole, equivalent to those we are paying. The non-ferrous metals might be shaded a little but steels are fairly firm."

SOME PRICES ARE SLIGHTLY LOWER

But Business Has Not Shown Any Improvement Since the Turn of the New Year

TORONTO.—Those who were predicting that a business recovery was going to take place at the first of the year must know by now that they were wrong. In some lines the prediction was doomed from the very outset, as January is never a very large month.

The machine tool trade is not making many sales, but the salesmen are working harder, and are bringing in business that would not have come along in the ordinary course of events. One firm told this week of having the order for several machines ready to sign, but the buyer was holding off on a matter of price. He seemed to be positive there was going to be a reduction made in the price of machine tools, and no amount of arguing will convince him that we should stand on our price. As a matter of fact the dealer handling this sale has nothing to do with the price of the tool, but there is a nice order hung up waiting for the buyer and seller to come together and close the thing out.

A fair trade is being carried on in used machines, and a number of these have been rebuilt during the past season. The price of new tools is quite an inducement to turn to this field.

Some Firms Starting

Some of the automobile concerns are getting under way now, and during the last few days they have placed some very good orders for parts. Some of the salesmen who were down that way looking for a share of the business report that there was the greatest gathering of salesmen seen at one place at one time after one piece of business that had been recorded for some time.

Some of the locomotive firms have bookings that will help to keep some trade moving. The question has been raised again regarding the drawback on export of Canadian material. For instance, one firm contracts with a foreign order for a certain number of engines, or cars, or anything in that line. When these are exported the firm is entitled to receive a drawback of 99 per cent. of duty paid for the material in case it was brought into Canada. If a Canadian manufacturer supplies materials for this manufactured article he is not entitled to any consideration in having to compete with the American manufacturer. If a Canadian manufacturer, for instance, needs nuts, bolts, etc., for an article to be exported, he can bring in United States material free of duty by reason of the 99 per cent. drawback on the finished article. The explanation of the tariff department of the Canadian Manufacturers' Association is that the tariff here is arranged this way in order to allow the Canadian manufacturer access to the cheapest source of supply, otherwise he could not secure the business.

The Steel Market Easier

Several prices are down a little in the steel market, and there is more or less of a tendency on the part of the dealers to shade their prices in order to land the business. It cannot be charged that there is anything approaching a cut-rate business going on, but the tendency toward "bargaining" is more marked than it has been for some time past. Black sheets 28 gauge are selling at 7.50c per pound, while blue annealed have been marked at 6.50. Premium 28 galvanized sells now at $10, and 10¾ at $10.40. Quarter-inch plate is quoted at $5 base; cold rolled shafting at $7 base.

Small Tool Sales

There are some rumors regarding cutting of prices in the Montreal district in small tools, but nothing general is being done in this line. It is impossible to keep dealers lined up at all times to adhere to standard prices, but for the most part there is very little price shading being done in any district now.

One thing is certain, though—salesmen are working harder for a given amount of business than they have been for some time past. The sales manager

POINTS IN WEEK'S MARKETING NOTES

One dealer in equipment for contractors states that from inquiries in their hands at the present time they are going to have the largest years' business they have ever done.

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Several reductions have been made in the last few days in the prices of some lines of steel in local warehouses, and there is a tendency at times to even do better than the quoted prices, but this has not developed into anything like a price cutting campaign.

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The scrap metal market remains very inactive, although the belief seems to be fairly well established that the bottom of the market has been reached and that any buying movement will result in firmer prices.

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Some of the large automobile plants expect to start work shortly, and are already placing a certain amount of business for parts.

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One large list of machine tools that went to the New York market was withdrawn because the purchaser insisted on lower prices.

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Dealers and salesmen generally report that there is more competition for business now than there has been for years, and every order that comes on the horizon brings forth a regular procession of salesmen.

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Pittsburgh dispatches claim that there is no improvement in the steel market as far as any business is concerned, and they further point out that January is not the month to expect such a movement.

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Some of the United States railroads would buy more equipment if it were not for the failure of the government to pay them their guarantee under the railroad act.

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Machine tool plants in the United States are for the most part closed down, or running on very short time. Canadian makers seem to be faring better than those across the border.

of one of Ontario's plants was telling Canadian Machinery this week that he had spent two or three days at the large auto shops trying to see what he could bring home in the way of business. He had succeeded in landing a nice share of the business, "but," he stated, "I never did see such an assortment of salesmen before, and I have been in the selling business for a good many years. Of course the orders being placed just now are not as large as usual, but in this case it looks as though the auto plant in question is getting ready for operations on a very fair scale."

Another salesman representing a small tool firm, has just made the trip through Western Canada to the coast, and reports conditions quiet in that field. "It is surprising where the business comes from in the west," stated a representative of this company, "to go through it one would never think there would be much demand for our line outside of a few industrial centres, but the figures from this field for the year just closed are well over the estimate we had set for this field."

THE PREDICTED REVIVAL DID NOT COME WITH THE NEW YEAR

Special to CANADIAN MACHINERY.

PITTSBURGH, Jan. 27. — There are lacking even the rumors that usually spring up in a dull season that the steel market is improving, which shows that the situation is particularly unpromising. Of course, the prediction made in December, that there would be improvement immediately after the turn of the year, has gone by the boards, as anyone should have expected it would since it is not natural for the steel market to improve in January. March is a favorable month for that, and there is still a possibility that there will be improvement at that time, but this is no more than a possibility. The common prediction is that there will be no great improvement until after the summer is over, but the predictions are indefinite in that they do not assert that there really will be great improvement at that time.

It remains the common view that all that is wrong with business is that a general readjustment in commodity prices and wage rates has to be made, but if that is all that is requisite there ought to be improvement within a very few months since the deflation is already quite extensive. It is true that thus far wage reductions have been exceptional rather than general, but it does not follow that extensive wage reductions will not be made within a couple of months. Many manufacturers, convinced that wages must be reduced, have simply been waiting until there has been a spell of idleness, in order to make wage reductions more acceptable. In the steel industry the latest reductions are those of the Inland Steel Company and the Steel & Tube Company of America, both in the Chicago district, the reductions amounting to about 20 per cent. The Pittsburgh and Youngstown districts have seen scarcely any reductions. The independent ore interests in the Lake Superior ore region are reducing wages 15 per cent. This, of course, is in anticipation of the expected reduction in Lake Superior iron ores for the season of 1921, the common guess being that there will be a decline of $1 a ton from the 1920 season prices. This would put ore prices back to the level of the 1919 season, making Mesabi non-Bessemer ore $5.55 at Lake Erie docks.

The Steel Corporation shows no signs of contemplating any wage reductions in any of its operations, and the trade believes that while the corporation will eventually reduce wages it will only do so after all the independents have taken action.

In some quarters a feeling is now arising that there may be something more wrong with the business than merely the need of price and wage readjustment. Increasing attention is being paid to the fact that many large business interests, supposedly in sound condition and believed to have made very large profits in the past few years, are borrowing money at high rates of interest, equivalent to between 7 and 8 per cent., on notes or on short term bonds, and the question is why this should be necessary if things are as they seem to be. There is satisfaction, of course, that there have been so few business failures. At the same time great credit is given to the operation of the Federal Reserve Act, and it is said that if this system had not been established there would have been many failures. However, the proper analysis of the facts seems to be that even though failures and a regular panic have been averted the fundamental conditions must be bad, more or less, or there would have been nothing to avert. It must be understood that when borrowings at high interest rates are mentioned the iron and steel industry is not referred to. This industry is perfectly sound financially and has no occasion to borrow money. It does a cash business and really got the profits it was making. Its inventories of raw and partly manufactured material are relatively low and it has no finished goods in stock.

Production

The rate of steel production has a generally declining tendency but the rate is very slow, because the Steel Corporation maintains its rate and the independent mills reached such a low operating rate in December that further decreases in their rate cannot make much difference. As noted in last report the Steel Corporation is producing steel ingots at about 21,000,000 tons a year and the independents at about 7,000,000 tons, which makes a rate for the whole industry of about 53 per cent. If the independent rate should be cut in half that would merely bring the rate of the whole industry down from 53 per cent. to 47 per cent.

The independents are operating intermittently. A mill closes for a week or two and then resumes in part on an accumulation of orders, while another mill may close to enable orders to accumulate. The next important change will occur by the Steel Corporation's production decreasing. The Steel Corporation entered this year with a large volume of business on books. It is not remarkable that the corporation's customers should "stick" but it is remarkable that they should continue to take shipments from week to week at such a high rate. How long the present operation will last is problematical. Many customers may say that they want the material eventually, but desire that shipments be made at say one-half the former rate. If there is no change in this respect it may be said that the specifications now on books would enable the corporation to continue at practically its present rate for a couple of months without the aid of new business, while if new specifications and orders should keep up at the present rate the time would be prolonged. Afterwards the corporation's production would gradually taper off. As to the independents, there is no indication that they will be able to run much better than at present until there is a general buying movement, and that is not expected for the near future.

Prices

There are the usual rumors of price cutting of steel products, in most cases quite indefinite. The condition is worse than that of orders being booked at cut prices, the fact being that orders are not booked at all. The mills are getting only a little business and what they are getting is chiefly, in the case of independents, in the form of releases on instructions previously given to suspend shipments. In the case of the Steel Corporation, the business being booked is either from regular customers or, in a few cases, from consumers who were not corporation customers during the 1920 flight of prices, and resolved that whenever the opportunity should occur for them to get on the corporation books they would embrace it.

Eventually a buying demand will develop and then there will be real price cutting to find the bottom, or basis on which business can proceed. That time may be far in the future.

REFUSED TO BUY WHEN SHOWN PRICES

New York Machine Tool Market Is Not Experiencing Any Recovery Yet

Special to CANADIAN MACHINERY.

NEW YORK, January 27.—No tangible improvement in the machine-tool situation is to be noted. It is true that there have been more inquiries in the past week, but orders are not being placed. The reason for lack of buying in some instances is the expectation of buyers that prices are coming down. The Otis Elevator Company, which about ten days ago issued an inquiry for about twenty machines, informed sellers after quotations had been received that it would await "better prices." Similar action was taken by one of the railroads, which had inquired for about a half-dozen machines.

Some of the railroads are in a mood to buy a moderate quantity of new shop equipment, but are held up by the failure of the government to pay them their guarantee under the railroad act. In fact, some of the roads are having difficulty in meeting their current bills. It is not regarded as likely that they will be able to do much buying before the middle of the year.

Many of the machine-tool plants remain closed down, or virtually so, while even those in the best position are operating at only a small percentage of their normal rate.

The meagre amount of buying in the new year has been a source of disappointment to those in the trade who quite confidently expected that an improvement in conditions would begin to make itself evident about this time. A disturbing element is the number of new machines which are being offered for sale at prices less than the manufacturers' selling prices. Some of these machines so offered were originally purchased for export and the orders were cancelled before the machines left New York. Consequently the export companies are trying to get rid of them, even at a loss.

CUTTING PRICES IN BRITAIN NOW

London—The steel makers along the northeast coast adopted a policy of drastic price-cutting, the reductions ranging from £2 per ton for rails and ship plates to £4 for billets.

It is stated in steel circles that the reductions bring a majority of the selling prices below the actual cost of production. The action of the northeast coast men follows that of the Scottish steelmakers in making a reduction of from 20 to 27 shillings per ton.

The drastic cutting in prices is said to have been necessitated by increased foreign competition, which has virtually stopped demand for the dearer home-made articles.

PLANTS LIKELY TO START AGAIN

There are some indications that plants in the automobile industry are not going to remain closed much longer. In this district there is little improvement and very few employees are working in the plants.

Car makers are begining to realize that if they are going to be in the running for this year's business they must get going in the very near future.

Speaking to a representative of a company handling sprinkler insurance, Canadian Machinery learned that several of the largest companies in the automobile business, which have been closed for some time, are not taking advantage of the shut down clauses in their policies. Some of these automatically allow a thirty-day shut-down, after which it is necessary to make application and take advantage of special provisions in the policy. This representative had been visiting a number of these places, and found that in the case of the larger ones there was no intention to take up the clauses regarding a shut-down of the plant for more than thirty days. There can be only one meaning to this, viz., that the plant is going to operate.

TRYING TO PUSH BRITISH GOODS IN CANADIAN MARKET

THE Montreal branch of the Canadian Association of British Manufacturers held their annual meeting at Freeman's Hotel on January 21. Following the luncheon the business was opened by the address of the retiring president, H. W. Weller, who outlined the work accomplished during the past twelve months, emphasizing the better progress that had been made as a result of the closer co-operation of the two branches, and the added interest that had developed in all activities of the association. Through the personal efforts of G. T. Milne, H. M. Trade Commissioner during the early part of 1919, and the enthusiasm of the officers and members since that time, much has already been achieved by the organization for the furtherance of British trade in the Dominion of Canada. Considerations have been obtained from the Government at Ottawa, regarding the customs valuation of invoices, that has simplified the work of importers and exporters. Recognition has also been given to the request for tariff modifications and steamship concessions — conditions that have assisted materially in promoting British trade. It was stated that negotiations were under way with kindred associations in other British Dominions for a permanent representative in London, with an office for the use of the members of the different associations.

Brief addresses were given by G. A. Marshall, Capt. John Harris and W. E. Bunny, president, vice-president and secretary, respectively, of the Toronto branch of the association. Emphasis was laid upon the necessity of every member working in accord with each other, and also co-operation with the branch officers, and likewise between the two branches, so that the work of the entire organization would be co-ordinated and maximum efficiency and benefit attained.

Owing to the fact that, henceforth, the government of the association shall be vested in the Supreme Council, the constitution has been revised, and the proposed draft was read to the members for their criticism and approval. Without a dissenting voice the draft, as prepared by the committee in charge, met with the unanimous approval of those present, and its adoption was decided on, pending the favorable consideration of the members of the Toronto branch, the annual meeting of which will be held on January 28.

The Montreal branch, at present, has two well organized trade sections, that of textile and steel, and it is expected that other sections will shortly be formed to accelerate the interest in other branches of trade development. It was likewise proposed that regular monthly meetings be held, as it was felt that, in this way, greater progress could be made and a more friendly spirit amongst the members in general created.

The local council for the ensuing year was elected at this meeting, and is as follows:

1st vice-president—F. I. Spielman.

2nd vice-president—J. E. Ritchie.

Executive Council—Allan S. Bain, St. Clair Tilley, Harold Brooke, W. T. Evans, H. W. Smythe, D. W. Clarke.

Want Material.—This paper can furnish the name of a firm wanting to get information about a supply of strip steel ¾-inch x 12 gauge, 1½ inch x 10 gauge, 15 carbon.

Ray W. Wolvin, president of the Dominion Iron and Steel Company, returned from London on January 24, where has been conferring with the directors of the British Empire Steel Corporation in connection with the consolidation of Canadian steel and shipping interests.

C. H. Handerson, advertising manager of Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, has gone to the Union Trust Company as advertising manager. Mr. P. C. Handerson, his brother, has replaced him at the Cleveland Twist Drill Company. The Union Trust Company is a consolidation of six large Cleveland banks and is the largest banking unit in Ohio.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$33 96
Lake Superior, charcoal, Chicago	48 50
Standard low phos., Philadelphia	44 79
Bessemer, Pittsburgh	33 96
Basic, Valley furnace	30 00
Toronto price:—	
Silicon, 2.25% to 2.75%	43.64

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 75
Steel bars, base, Toronto	4 75
Iron bars, base, Montreal	4 50
Steel bars, base, Montreal	4 50
Reinforcing bars, base	4 75
Steel hoops	6 00
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	5 50
Chequered floor plate 3-16 aud heavier	7 50
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	3 50
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	5 00
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Montreal	Toronto
	Gross.	
Lake copper	$19 00	$19 50
Electric copper	18 50	19 00
Castings, copper	18 00	19 00
Tin	44 00	46 00
Spelter	8 00	9 00
Lead	7 25	8 00
Antimony	8 00	9 00
Aluminum	34 00	35 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 5 50	$ 5 50
Plates, ¼ up	5 00	5 50

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
⅛	$ 6 50	$ 8 50	$.....	$.....
¼	5 31	7 41	5 91	8 01
⅜	5 31	7 41	5 91	8 01
½	7 10	8 63	7 95	9 18
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	27 84
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 87	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½" and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

	Montreal	Toronto
Copper, light	$10 50	$10 50
Copper, crucible	13 00	12 00
Copper, heavy	12 50	12 00
Copper wire	12 50	12 00
No. 1 machine composition	13 00	12 00
New brass cuttings	7 00	9 00
Red brass turnings	10 00	10 00
Yellow brass turnings	7 00	7 50
Light brass	5 00	5 00
Medium brass	6 50	6 00
Scrap zinc	5 00	4 00
Heavy lead	5 25	4 00
Tea lead	2 50	2 00
Aluminum	16 00	13 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	18 00	16 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	20 00	20 00
No. 1 machine cast iron	32 00	28 00
Pipe, wrought	8 50	10 00
Car wheel	30 00	30 00
Steel axles	20 00	18 00
Mach. shop turnings	8 00	7 00
Stove plate	23 00	23 50
Cast boring	8 00	10 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	Net
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	—20% 25 and 5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$5 75
Cut nails, base	6 70
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 29
British Manila rope	0 28
New Zealand hemp	0 23

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net

LeBLOND
HEAVY DUTY
Universal Millers

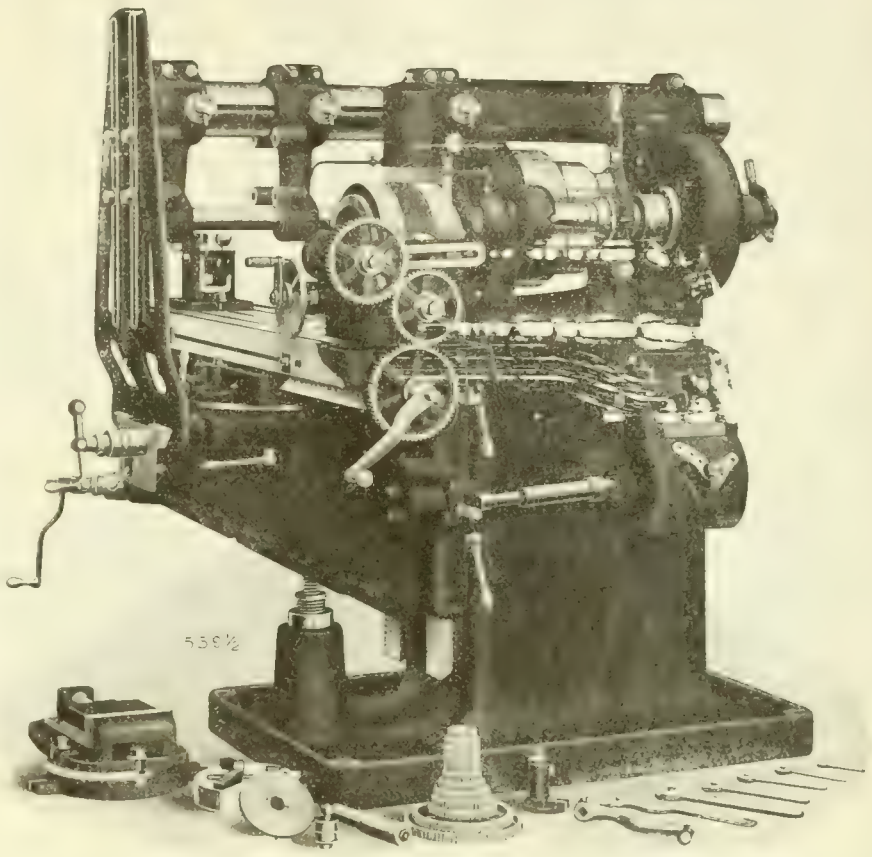
Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control?

Carried in stock by

The A. R. Williams Machinery Co.
LIMITED
TORONTO



Pig Iron Markets

The trend of the pig iron market is toward still lower levels. Valley No. 2 Foundry has been offered at $30 and Basic at $29. Pig iron buying has improved to some extent in the Philadelphia district. About 5,000 tons were sold during the past week.

The Chicago market is exteremely dull with melters disinterested and only occasional purchases being made of carloads. Little new business is being done on the Cleveland market, although inquiries are declining and one lot of 1,000 tons for the next 30 days has been quoted at $30 base Valley.

Altogether the sales during the past week on the New York were not greatly in excess of 1,000 tons.

The pig iron market at Pittsburgh has been more active than for several weeks past. It is understood that one sale has been made of 1,000 tons of No. 2 foundry at $30 valley.

The Boston market shows practically no business. Many of the stacks of furnace interests supplying this district have blown out.

The Buffalo market shows a wide range of prices. Sales of No. 2 foundry 1.75 to 2.25 silicon are recorded all the way from $32 to $35. It has been stated on reliable authority that considerable amounts of No. 2 have been sold at $30. A maker that has figured prominently in the resale market reports last week as the heaviest in about three months. About 4,000 tons of foundry of all grades were sold. No. 2 plain sold at $32; No. 2x 2.25 to 2.75 silicon at $35.25 and No. 1x 2.75 to 3.25 at $35.

The St. Louis market reports a total absence of business and the attitude of consumers is discouraging, as they will not do business until prices are reduced.

Scrap Metal Market

Some dealers believe that the scrap metal market has at last reached bottom.

The Chicago market during the past week has shown very little change. Actual prices are difficult to quote at present. Scrap consumers for the most part are remaining out of the market. Rail road offerings are moderate. Prices which last week were considered as being rock bottom have been lowered several dollars and the demand is so light that even the low prices fail to move much tonnage. Heavy melting steel is down to $9 and mixed borings and turnings have dropped from $7 to $5.50.

The New York scrap dealers report a better inquiry for wrought material. More interest is being shown by the rolling mills and this has resulted in a greater firmness in prices.

The Pittsburgh market is exceedingly quiet. The usual industrial sources of supply are not operating so there is very little tonnage appearing. One of these sources is the automobile industry, which furnished large tonnages of turnings and borings for the Pittsburgh and valley territories.

On the Buffalo market one local mill is taking tonnages of scrap on suspended old orders, and is contracting for several new lots in small quantities. They are offering $15 for heavy melting steel.

Dealers in the St. Louis market are beginning to purchase scrap, and the heavy railroad offerings have brought forth better bids. Heavy melting steel and shoveling steel were marked up 50 cents, the former being quoted at $14 to $14.50. Rerolling rails have risen from $15 to $16.50 to $17.

The scrap market continues to lag in the south. Hope is expressed at Birmingham that a turn for the better will take place soon. Quotations remain practically unchanged.

What is claimed to be the most powerful wireless transmission station in the world was opened recently at Croix-d'Hins, eighteen miles from Bordeaux. The station, the aerial of which has eight pylons 850 ft. high, is designed to reach, in normal circumstances, any point in the world, including New Zealand, while North and South America will be within its effective radius, however bad the atmospheric conditions.

MISCELLANEOUS

Solder, strictly	$ 0 27½
Solder, guaranteed	0 29½
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	15 00
Gasoline, per gal., bulk	0 42
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	70	80
Class B	24	34
Class C	16	24

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 7 50
Sheets, blue ann., No. 10	7 00	6 50
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	....	.....
Queen's Head, 28 B.W.G.	13 00	.....
Fleur-de-Lis, 28 B.W.G.	12 50	.....
Gorbal's Best, No. 28	....	.....
Colborne Crown, No. 28	....	.....
Premier, No. 28, U.S.	10 00	10 00
Premier, 10¾-oz.	10 50	10 40
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.....	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	19

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

WASTE

XXX Extra	23	Atlas	19
Peerless	22	X Empire	18½
Grand	21½	Ideal	18
Superior	21½	X Press	17
X L C R	20		

Colored

Lion	16	Popular	12
Standard	14	Keen	10
No. 1	14		

Wool Packing

Arrow	35	Anvil	22
Axle	28	Anchor	17

Washed Wipers

Select White..20 Dark colored.09
Mixed colored.10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ....10% Best grades..15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$35 00	$37 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	40 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	43 00	46 00
Copper sheet, planished, 16 oz. base	47 00	50 00
Braziers', in sheets, 6 x 4 base	39 00	42 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 50	$14 50
Sheets, 3½ lbs. sq. ft.	10 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

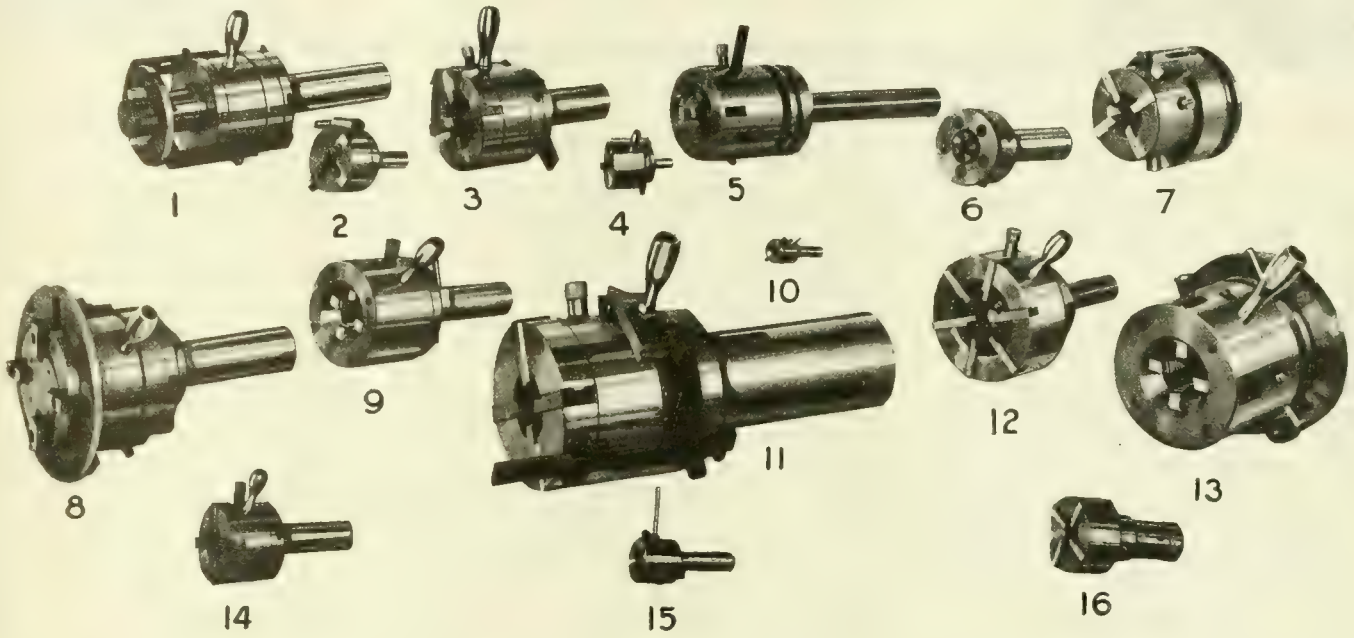
PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04¾
Acid, nitric	.11
Acid, sulphuric	.04½
Ammonia, aqua	.15¾
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.16
Copper, carbonate, annhy.	.41
Copper, sulphate	.13
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.20
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lbs.	9.00
Sodium phosphate	.15
Tin chloride	.30
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

GET THEIR NUMBER

Numbers 1 to 16 represent one of the Geometric Self-opening and Adjustable Screw Cutting Die Heads, Solid Adjustable Die Heads and Adjustable Collapsing Taps.



No. 1—Class N-L Pipe Tap. Made in sizes from ¾" to 10" inclusive. Represents tapped diameters of 1-1/16" to 13-1/2" straight threads, and 3/4" to 12" standard pipe threads.

No. 2—A Geometric Brown & Sharpe Taper Turning Tool.

No. 3—Style C Die Head, Lever Trip Type. Recommended for cutting threads of short length.

No. 4—Two-Chaser Class U Tap, for tapping fine pitch threads, ranging from 1/2" to 1-5/16" diameters.

No. 5—Style D-D Die Head for Cleveland Automatic. Floating and tripping adjustment features make this a very desirable Die Head for these machines.

No. 6—Adjustable Hollow Milling Tool. The cutters are readily removed for sharpening. Micrometer adjustment makes quick and easy settings.

No. 7—Rotary Die Head. Recommended for live spindle use.

No. 8—Class P Tap, Plate Trip Type. Used wherever tripping plate can come in contact with the work.

No. 9—Style D Die Head. For general use where thread is not too short. Made in sizes from 5/16" to 4-1/2" inclusive. Represents threaded diameters of 3/32" to 4-1/2".

No. 10—A 1/8" Style D Die Head, the smallest size. Cuts down to 1/16" diameter thread.

No. 11—Taper Threading Die Head, with inside trip and roughing and finishing attachment. Recommended for coarse pitch taper threads.

No. 12—Style C Die Head, Inside Trip Type. For cutting short threads where the length of thread is best controlled by an adjustable internal gauge or stop.

No. 13—Style D-D Die Head, with roughing and finishing attachment. Flanged for Warner & Swasey Turret Machine.

No. 14—Style C Die Head, Pull Off Type. For cutting threads on light work.

No. 15—Style C Die Head for Brown & Sharpe Automatics.

No. 16—Solid Adjustable Die Head with floating shank, for Gridley Automatic.

These Die Heads and Taps are adapted for use on the turrets of practically all makes of hand and automatic screw machines and turret lathes.

By using extra sets of Thread Chasers, each tool can be used for a range of diameters; the larger the size of tool, the greater the range.

Make screw thread cutting the most satisfactory operation in your Shop. Let a GEOMETRIC show you how.

THE GEOMETRIC TOOL COMPANY

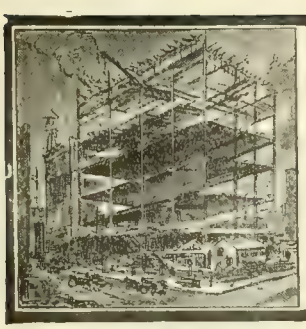
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.

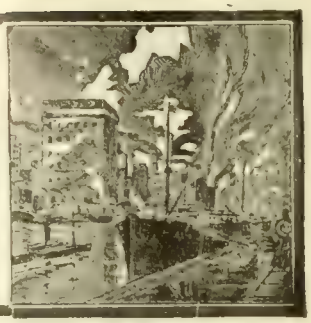
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



MEETING IN MONTREAL TO ORGANIZE THE WELDERS THERE

WORKING in harmony with a meeting held recently in Toronto, relative to the organization of a Canadian Welding Society, A. M. Barry, manager of the St. Lawrence Welding Company, of Montreal, called a special meeting of those in this district interested in the movement. The meeting was held last Thursday at the Windsor Hotel, and although the notice given was necessarily brief, a goodly number of firms were represented. Those present, beside Mr. Barry, were:—A. McMillan of the Canada Carbide Co.; C. Royer, of Welding and Supplies, Ltd.; A. F. Dyer, welding supervisor of the G.T.R. at Pt. St. Charles; P. Reynolds, Supt. of the St. Lawrence Welding Co.; W. G. Cole, of the Advance Machine Works; W. P. Bennet, of the Canadian Welding Works; T. Jones, works-mgr., of the Canadian Vickers Co.; H. P. Booth, plant manager of the Montreal Locomotive Works; D. Buttler, L'Air Liquide Society; and J. H. Rodgers, of Canadian Machinery.

In opening the meeting Mr. McMillan, the chairman, who, with Mr. Barry, had been present at the Toronto meeting a couple of weeks ago, outlined to those present the objects of the proposed association and the initial steps that had already been taken at the inauguration meeting. A copy of the proposed constitution had been received and the different clauses and sections were discussed. The meeting was unanimous in its decision that an association, well founded, would be highly beneficial, not alone to those associated with the society, but to the welding industry in general. It was the opinion of those present that the science of efficient welding was not making the progress that it should, and that, in some instances, great harm was being done and development retarded, due to the inefficiency of much work carried on by inexperienced operators, the results in such cases often giving a temporary "black eye" to the better progress of the welding art.

It was stated by Mr. Barry that the Government had the question of welding standardization under consideration, and it was only a question of time before they would be faced by certain regulations governing the practice of welding in general. It was therefore thought that a well organized body of experienced welding men would be better able to cope with the situation and at the same time present a united front in protecting the interests of the craft, and likewise provide better facilities for disseminating knowledge amongst its members.

While the proposed constitution, on the whole, was favorably received by the Montreal gathering, several clauses were the subject of criticism and discussion. One of these was that in regard to standardization in welding practice. As this was too wide a subject to be passed over lightly, and at such an early date in the activities of the association, it was deemed advisable to instruct the Montreal delegates attending the forthcoming meeting in Toronto to obtain further enlightenment in regard to the question of "standardization." Mr. Dyer of the Grand Trunk, remarked that the practice in railroad shops was, invariably, carried out under specific regulations, but that the system on one road differed from that on another, and sometimes, to a great extent.

Exception was taken to the "head office shall be in Toronto." Due to the fact that the proposed constitution called for the election of officers by letter ballot, it was not clearly seen how an arbitrary ruling could be made in this connection, as it was possible that the election of officers might result in the president and secretary being elected from points outside of Toronto. However, the Montreal interests are determined to work in harmony with those in Toronto and other centres, so that this point will receive full consideration at the next general meeting.

Still another feature was that respecting local branches. The constitution did not clearly define the organization details, and in view of the announcement of annual dues for the different grades of members, it was thought advisable to have a better understanding on this question, particularly on the point of financing branch societies, before committing themselves. Before the meeting adjourned a short discussion took place on some practical problems, and the interest shown indicated the advantages that would be derived by periodically meeting together and discussing one another's difficulties and experiences. Several present announced their intention of attending the meeting to be held in Toronto on the 26th of this month.

LLOYD HARRIS LOOKING FOR A SELF-CONTAINED STEEL INDUSTRY

The Editor, Canadian Machinery.

Sir,—My attention has been called to an item in the issue of your journal dated Jan. 13th last quoting from an address I delivered before the Canadian Club at London, Ont. I wish to make a correction which I hope you will publish in your next issue.

When dealing with the Canadian steel industry, I stated that one of the means which we could employ to reduce our imports from the United States is to produce in Canada the $150,000,000 of steel imports we are now bringing in from the United States; that many experts had stated in the past that our steel industries in the interior of Canada would be handicapped for the reason that they had to import coal and ore from the United States as although Canada is rich in iron ores, they could not compete with American ores, on account of their refractory nature.

I went on to say that this situation is likely to be changed, as with the development of scientific methods, Canadian ores are likely to be used in the future. I referred specifically to the fact that the steel industry situated in the eastern part of Canada is exceedingly favorably situated as their coal and ore are at their doors.

I would not like to have the impression get abroad that all the coal used in the Canadian steel industry comes from American mines as I am in hopes that Canada will have a self-contained steel industry in the future by utilizing our own ore resources in all of our steel plants, and that with the deepening of the St. Lawrence River and Welland Canal, we will be able to use Canadian coal in all of the plants in competition with American coal, my thought being that we should make our Canadian industries self-contained to the utmost possible extent. Yours very truly,

LLOYD HARRIS.

STEEL & IRON PRODUCTS

Quality

Service

OF EVERY DESCRIPTION

HAMILTON PIG IRON

Basic Malleable Foundry

STEEL AND IRON BARS

OPEN HEARTH STEEL SHEETS

RAILROAD TRACK MATERIAL

Angle Bars Track Bolts Tie Plates Tie Rods Spikes

SCREWS	WIRE	NAILS
Steel	Steel and Brass, Copper and	Wire
Brass	Bronze, Heavy and Fine,	Cut
Bronze	Bright, Annealed, Coppered,	Boat
Wood and	Galvanized, Tinned, Stranded,	Horseshoe
Machine	Steel and Copper Cable,	Shoe Nails
Screws	Barb, Woven Clothes Line	Tacks

POLE LINE HARDWARE

Pole Steps Cross Arm Braces Guy Clamps Guy Rods

WROUGHT PIPE	FORGINGS	LEAD PRODUCTS
Black Pipe	Car Axles	Lead Pipe
Galvanized Pipe	Shape and Drop Forgings	White Lead
Nipples	Carriage and Automobile	Shot
Couplings	Hardware	Putty

BLOOMS
BILLETS
PLOW BEAMS
ANGLES
CHANNELS

THE
STEEL COMPANY
OF
CANADA
LIMITED

HAMILTON MONTREAL

WIRE RODS
HORSE SHOES
FENCING
RIVETS
BURRS

If interested tear out this page and place with letters to be answered.

The Week's Events in Montreal Industry

Thomas Hall, proprietor of the Hall Engineering Works and managing director of the Montreal Drydock and Ship Repairing Company, has been elected as one of the four commissioners for the city of Montreal West.

An address on "The Construction of the Toronto-Hamilton Highway," illustrated by lantern slides and motion pictures, will be given by H S. Van Scoyoc, of the Canada Cement Co., at the regular meeting of the Engineering Institute of Canada, on January 27. The annual general and professional meeting of the institute will be held in Toronto on February 1, 2 and 3.

The Dominion Metal Company, of Sherbrooke, Que., are now distributing to the trade a new line of Olanda products. The Olanda cast steel cement is used for filling defects in steel castings. The Olanda high temperature plastic cement, used for furnace work, will, it is stated, withstand a temperature of 3,000 Fah. Another line is Olanda foundry facing for molding purposes.

C. H. N. Connell, district engineer of the Canadian National Railways, has been promoted to the position of district engineer at Toronto, with jurisdiction over all lines in Ontario. Mr. Connell became associated with the C. N. R. in 1909, when he was appointed engineer of maintenance of way over the Quebec division. In 1914 he was appointed divisional engineer and promoted to district engineer in the early part of 1918.

One of the features of the annual meeting of the Pulp and Paper Association, held last week in Montreal, was the moving pictures shown in connection with present day methods of paper making in its many departments. The films were complete in every detail, showing as they did every essential operation and process, from the planting of the young trees to the making, weighing and rolling of the paper for commercial use, and the transportation of it to the different large centers.

One of the best exhibits of motor cars, trucks and accessories ever shown in the Dominion is now being displayed at the Montreal Motordrome on Sherbrooke. The entire three floors are devoted to the exhibition, and in addition to this it has been necessary to construct an extra building to take care of the overflow. In all about 150 firms are represented at the show including about two score of motor and truck manufacturers. The exhibition will continue all of the present week. Victor Levesque is the general manager.

Walter Lambert, naval architect, 14 Place Royale, Montreal, is now getting prices from Canadian shipbuilders for motor barges for carrying pulpwood and specially designed for shallow draft conditions for mechanical unloading. It is expected, provided prices are acceptable, that contracts for same will be placed immediately, in which case ships will be in service in the St. Lawrence during the coming season, and being of special type will doubtless attract considerable attention. Mr. Lambert hopes at a later date to be in a position to publish plans and specifications of these ships.

Reports of the twenty-first annual meeting of the Canadian Forestry Association, held in Montreal last week, showed that the association had completed one of the most successful years in its history, both as to finances and as to membership, the latter now numbering about 12,500. The forest conservation propaganda carried on by the publicity bureau has been favorably received in all quarters and the good results attained has decided the association in taking further steps to augment these activities that have proven so beneficial during the past year. The president, C. E. E. Ussher, was again elected for the ensuing year, and Robson Black, of Ottawa, was re-elected secretary.

What will be the largest garage in Montreal and one of the largest truck garages in North America is that of the Albion Motors, Ltd., at 63 Prince St. The premises occupied by the Albion is the old central station of the Montreal Light, Heat and Power Company, and the building is one admirably adapted to the use which is now being made of it. The structure extends the whole distance from Prince to Queen streets, occupying 28,000 square feet of floor space and affording over one million cubic feet of shop and storage space. It was opened last May by the Albion Motor Co., and the place has been partly occupied by other interests since then, but with the running out of leases this May it will be entirely occupied by the present owners, the Albion Company having purchased the property.

The Canadian Pacific Railway has announced its intention to offer two free scholarships, covering four years' tuition in architecture, chemistry, civil, mechanical or electrical engineering, at McGill University. The scholarships are open to apprentices and other employees under the age of twenty-one. The necessary requirement will be the passing of the regular entrance matriculation examination provided for in the annual calendar of the University, and the two candidates receiving the highest averages and complying with the requirements for admission will be awarded the scholarships and have the option of taking any of the above courses. Rules governing the continuance of the course provide that the holder shall meet the necessary requirements for the next higher year. Interruption to studies may be granted by giving due notice to the railway company.

LOOKING FOR A RECORD YEAR NOW

Dealer in Contractors' Equipment Has More Inquiries Than Ever This Season

Canadian Machinery had the opportunity this week of discussing trade prospects with the representative of a firm specializing in new and used contractors' equipment. There was no doubt in the mind of this dealer regarding the business they were likely to do this year, and he was ready to brand it as likely to be "the best year's business we have ever done."

"I am basing this statement on the number of inquiries that are coming in now regarding the securing of equipment for the 1921 building season, and a number of these want to get delivery very soon in order to be in shape to put in a full season's work. Nor can it be said that these inquiries come from any particular section, as nearly every corner of the country is represented in the list."

U. S. RECOGNIZE BRITISH EXPERT

Sir Robert Hadfield Brought Out Steel of Great Use During War

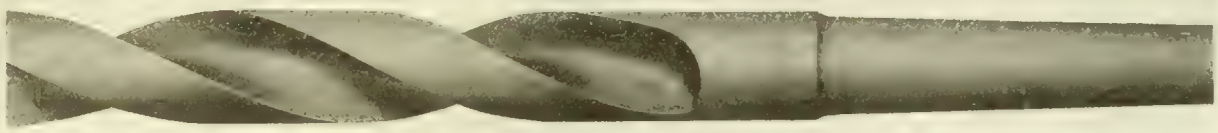
Sir Robert Hadfield, inventor of manganese steel and leader of the British steel industry, has been awarded the John Fritz gold medal for notable scientific and industrial achievement, it was announced by the John Fritz Medal Board, of New York, representing five leading United States engineering societies. Manganese steel was first described by Sir Robert in 1893, but it did not become generally known until the war demanded armaments in which toughness was combined with great strength. Manganese steel is non-magnetic, and millions of helmets made of this material were worn during the war by British, United States and Belgian soldiers. In addition to inventing manganese steel, Sir Robert discovered a magnetic steel of high permeability especially suited for use in dynamos and motors.

GARLOCK WALKER

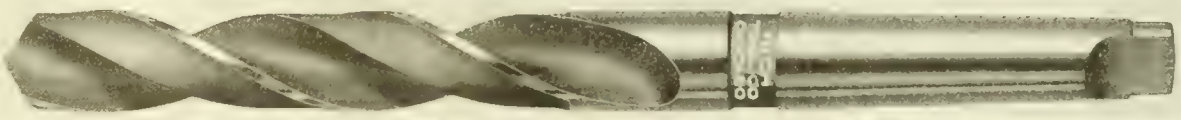
HIGH GRADE MACHINE TOOLS

RICH
TWIST DRILLS

THE BLANK



THE FINISHED DRILL, RICH STANDARD №20



RICH HIGH-SPEED DRILLS are not brazed, welded or built up, but forged from the bar and twisted at the proper temperature, giving them physical properties superior to those of the original bar. They are built to stand hard duty and retain a keen edge for long periods.

Other RICH products consist of TRACK and BOND BITS, BRIDGE REAMERS, RIVET SETS and COUNTERSINKS in a wide range of sizes and styles, all distinguished for the quality and quantity of work which they perform.

G&W MACHINERY

Shipped the Same Day as Ordered from

GARLOCK-WALKER MACHINERY CO., LIMITED

32 Front Street West TORONTO Telephone Main 5346

MONTREAL AND WINNIPEG

METAL and WOODWORKING MACHINERY of all Kinds

If interested tear out this page and place with letters to be answered.

THERE IS AN OPENING IN THE BRITISH MARKET FOR CANADA

MR. CECIL G. HORTON, assistant manager, Engineering and Machine Works of Canada, St. Catharines, has spent some time in Britain introducing a new type of steam shovel. Some of his observations should be useful to Canadian exporters:

"When one is situated as we were with a product to introduce which was comparatively unknown in Great Britain, I only know of one sound plan of action. You must go over and study the market for yourself. When you get there you should spend considerable time in gathering up all the information available bearing upon the successful introduction of your product. Then you should spend a little longer in sifting out that information before acting. It is best to make sure of your ground before the buyers even realize that you are in the country. The ordinary channels of publicity will not serve you at first and it will be futile to attempt any general appeal to the buyers. No unknown machinery will be taken up by the British market until its value has been demonstrated to the individual purchasers, and you should not begin to look for sales until you have digested the salient features and the peculiar tendencies of the market which you are attempting.

"When your preparations are complete and you are ready to approach prospective customers, your attitude and method are of first importance. Today Canada enjoys distinct prestige in Great Britain. More than that, Great Britain is beginning to realize that Canada can manufacture. So that the way you go about your business is of utmost importance, as you are creating impressions of Canadian selling methods that will last far beyond the present instance. Moreover, it is wise to distinguish Canada from North America. There is no better way to impress this fact on the British buyer than by observing a studied caution and moderation in salesmanship. The first great fundamental for all salesmen in the British market is to watch their language. The British dislike exaggeration in any form, and they expect you to be explicit and straightforward in all your dealings with them. You must have conclusive proofs regarding your product, and you must convince them with a minimum of superlatives. They are suspicious of too much virtue, and are not inclined to take what Americans and Canadians would consider justifiable chances. I do not mean that they are not receptive and open to conviction; but I do think that greater care is necessary to ensure successful business in Great Britain than in our own market. Now, a salesman perhaps cannot change his methods overnight, but if he studies British business men, he can quickly ascertain their etiquette and their prejudices; and this must be the first achievement of the successful Canadian exporter.

"As we were introducing an article hitherto unused, our main approach to British buyers was direct, and advertising was a secondary consideration. However, I believe that the British trades papers could be used successfully when once an article has been introduced. They are widely read, and are excellent, especially in a technical sense. Exhibitions also play a considerable part in advertising and sales campaigns over there. These exhibitions are planned without reference to any sight-seeing, and they attract the most aggressive elements of British business. As to general advertising, there should be cooperation between the Canadian manufacturer and his British representatives. The manufacturer at home is in a position to compile advertising information, and the representative abroad can effectively handle the distribution. Personally, we found the Trade Commissioner service of value in putting us in touch with the buyers, and believe that this service could be used more by Canadian manufacturers for the securing of both information and connections.

"For representatives, we found it expedient to use the established British importing houses. Here again the fact that we were introducing a hitherto unused article governed our choice. These importing houses have very wide connections, and they give immediate access to trade circles. It seems improbable that anything resembling an export pool could be successfully formed by machinery manufacturers. Machinery products are intricate as a rule, and the more direct the route from the manufacturer to the user the better. The question of foreign representation arises in other than the sales capacity in machinery lines. The matter of a service station abroad must be considered, as the best of mechanics cannot master a new machine overnight. At present we ship k.d.s. (knocked down state), and our mechanics assemble our machines abroad. With increased sales this may or may not necessitate permanent technical representation abroad, but it is a point to be considered when one is entering the export field.

"In conclusion I would like to emphasize the opportunities for Canadian machinery. Great Britain needs more houses than she can possibly construct. I visited one center near London where a complete new city was being built with authorized plans for a population of sixty thousand. There are other developments of almost equal magnitude, so that it would be difficult to exaggerate the openings for every sort of building material. Speaking more particularly for firms similarly placed to ourselves, it would seem wise for Canadian manufacturers to exploit their present-day advantages, because, although money is tight now and the rate of exchange unfavorable to the British buyer, as these two factors approach normality competition will become keener and established connections will then have value all their own. With British buyers such a connection is well-nigh permanent if only the seller watches his end properly."

Trade Gossip

Build Coke Plant?—The Semet-Solvay Co., the largest concern of its kind in the world, is considering building a four million dollar by-product coke oven plant at Hamilton, it is announced. It is said this would produce all the artificial gas necessary to meet Hamilton's needs for several years.

Have Orders.—As the result of the annual furniture exhibition at Kitchener the furniture industries there have been provided with large orders by buyers from all parts of Canada and some of the leading cities of the United States. Manufacturers here express entire satisfaction with the outcome of the exhibition and claim that there are bright indications of early revival of the furniture trade.

In the Maritimes.—Hon. E. K. Spinney, minister without portfolio, has arrived in Ottawa from his home at Yarmouth, N.S. Mr. Spinney expects to remain here until after the opening of the session. Mr. Spinney stated that there was little unemployment in the Maritime provinces outside of St. John and Halifax, and that business conditions were as good as could be expected during the present period of readjustment.

Conditions in West.—A Winnipeg report says:—G. E. Carpenter, secretary of the prairie division of the Canadian Manufacturers' Association, who attended the manufacturers' conventions in Edmonton, Calgary and Medicine Hat, reported that great confidence was expressed at these gatherings regarding market conditions for 1921. Every effort is being made, Mr. Carpenter reported, to keep plants running at full strength. In respect to unemployment in the west, such distress as prevails is being efficiently handled, Mr. Carpenter said. In his opinion, lack of employment was not as severe as in many former years.

Showed the Books. — The Dominion Steel Corporation opened its books to a committee of its employees which waited on the management so that they could see for themselves that orders are slack and the recently announced wage reduction necessary. The committee called to ask General Manager Merrill to cancel or at least modify the 20 per cent wage cut. Concerted efforts to end the strike of railway yardmen at the Dominion Steel Corporation plant and the Nova Scotia Steel and Coal Company's plant are being made by the steel companies, the federal department of labor and the Canadian National Railways, it is claimed in the Brotherhood of Railway Employees circles.

MORROW

Set Screws
Cap Screws
Semi-Nuts
Drills
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NONE BETTER

Order by the Name

Works at

INGERSOLL

Office and Warehouse
489 St. Paul Street West
Montreal, Que.

If interested tear out this page and place with letters to be answered.

A Drinking Water Service that will last a LIFETIME

What you pay for a few ordinary drinking cups will meet the cost of the

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY. Let the Puro deliver clean, fresh, water at a reduction of 15 per cent. to 35 per cent. in water bill.

"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.

Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."

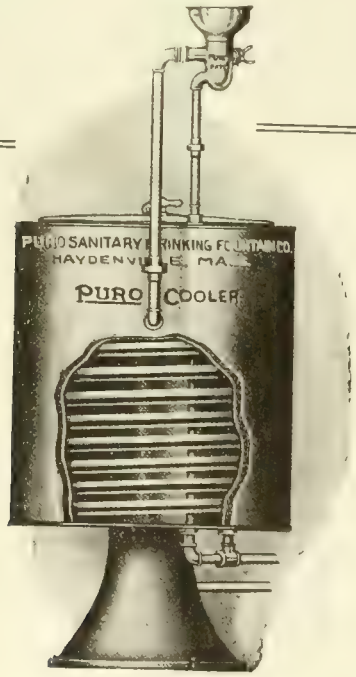
Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

Puro Sanitary Drinking Fountain Co.

Canadian Agents.

McKENZIE BROS.

888 F St. Andre St., Montreal, P.Q., Canada



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OVENS

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

Brantford Oven & Rack Co. Ltd.

Brantford, Canada

BLACK DIAMOND OVENS

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Consulting and Designing — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road. - St. Catharines, Ont.

MACHINE AND BENCH **VISES**

Write for Prices

Superior Machinery Co., London, Canada

BOLTS AND RIVETS

We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.

QUALITY PRODUCTS

LONDON BOLT & HINGE WORKS

LONDON, CANADA

Engineering

F. C. Weston Company, Marbleton, Que., is building a garage at a cost of $9,000.

A new mill is being erected by P. N. Mathieu, Montmorency, Que., at a cost of $8,000.

The Warren Bituminous Paving Co., Ltd., 19 Melinda St., Toronto, will erect a storage shed.

The Twin City Arena Company, Kitchener, Ont., are planning the erection of arena and artificial ice plant.

A service station will be built on Dundas Street West, near St. John's Road, by the Imperial Oil, Ltd., 56 Church Street.

A site has been secured and plans approved for the proposed new Albert College, Belleville, Ont. The cost is estimated at $600,000.

It has been decided by the Saskatchewan Co-operative Creamery Company, Swift Current, Sask., to erect a cold storage warehouse in that city.

The Snider Bros., Vancouver, have received the general contract for erection of warehouse for Vancouver Trading Company, 136 Water Street.

A machine shop and boiler house is to be erected by Canadian National Railways, 411 Dorchester Street, Montreal, at an estimated cost of $25,000.

The Ontario Cement Company, 51 George Street, Brantford, Ont., plan the erection of a factory. Tenders will be called in March.

The American Well Works Company has been taken over by the Mack Furnace Company, Chatham, and they will remodel it to suit their requirements.

The Dominion Canners, Ltd., have awarded the general contract for the erection of factory costing $20,000 to J. F. Nichols, 116 Summer Street, Niagara Falls.

The Old Eagle Foundry, conducted for years by John Smith & Sons, St. John, N.B., has been taken over by M. Harrigan and Frank Howard, and they are doing a general jobbing business under the firm name of Courtenay Bay Iron & Brass Works.

BELTING

Machine Tools

FOR SHIPBUILDERS & IRON & STEEL WORKS

BERTRAMS LIMITED

EDINBURGH

W. F. Pollock, president Victor Saw Works, Springfield, Mass., was at the Hamilton, Ont., office for several days last week.

H. W. Holmes has accepted a position with the Canadian Hart Products, Ltd., as sales manager. Mr. Holmes was for several years manager of the Hamilton, Ont., plant of the Victor Saw Works.

The Canadian Ingersoll-Rand Company, Sherbrooke, Que., has secured the Canadian rights for manufacturing Telsmith crushers and primary breakers as built by Smith Engineering Works, Milwaukee, Wis.

Wiggett Electric Company, 82 Wellington Street, Sherbrooke, Que., formerly Electric Motor and Repair Company, will move into their new building at above address shortly and will do all sorts of motor repairing and selling of motors up to 50 h.p.

The Dominion Government has awarded the Sheehy Bros., of Peterboro, the contract for the construction of a new dam across the Otonabee River at Nassau, a short distance from Peterboro. The dam will, it is estimated, cost about a quarter of a million dollars, and is to be completed by December, 1922.

Mrs. Clara E. Speight-Humberston, 62 Thorold Avenue, Toronto, claims she has accomplished the transmuting of zinc into copper by means of electric currents, using a solution of granite. If this has been actually achieved, it will completely revolutionize our knowledge of transmutation of metals.

The death occurred on January 20 of Major Alfred T. Tomlinson, a prominent civil engineer, at his home on Avenue Road, Toronto, following an illness of two months. Major Tomlinson was a member of the Engineering Institute of Canada, the American Society of Civil Engineers and the American Engineering Association.

The steel makers along the northeast coast of England have adopted a policy of drastic price cutting, said to be owing to the increased foreign competition, which has virtually stopped demands for the dear home made articles. The reduction ranges from £2 per ton for rails and ship plates to £4 for billets.

The Lang Manufacturing Company, one of Guelph's infant industries, has forged ahead rapidly since its establishment in May, 1918. Since that time the small building in which it began its career has been enlarged twice to accommodate the increasing business.

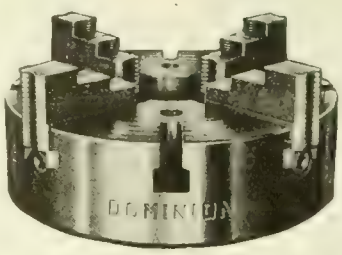
The Lang company first manufactured the Guelph convertible seats, but soon branched out into the manufacturing of architectural iron work, flax machinery, medium and small rubber moulds, welded tanks, special small machinery, and a general machine business. They also do a big business in oxy-acetylene welding.

Evidence of its growth is shown by the fact that at its beginning two men, members of the firm and skilled mechanics, did the work and the employees now number 23. One of the most important products lately placed on the market and which is attracting much attention is a bearing of unusual design. It was invented by William Ridsdale, of Guelph, and is called the Ridsdale reinforced bearing. The idea is this: A spring or spiral made of a certain alloy is placed in the bearing cap or housing. Babbitt is next poured into the bearing, but the babbitt is merely a holder of the reinforcements. The claim for this bearing is that there are no hard spots in such construction, also that the cheapest grade of babbitt can be used with good results as the wear comes on the reinforcement and not on the babbitt. The company claims that it can be used in any bearing including those where speed and pressure is extreme. The bearing is said to have a tensile strength of 36,000 pounds per square inch against a much lower figure for babbitt only.

The firm is popular with its employees, no doubt to some degree due to the splendid working conditions provided.

Fatal Accident.—Lying on his stomach, looking down an elevator shaft in the Sunbeam Lamp Works, 221 Dufferin street, Toronto, George J. Pond, aged 45, of 15 St. Clarens avenue, was crushed to death by the elevator cage. Fred Read, 146 Booth Avenue, was searching at the foot of the shaft with a lantern for a gold locket which had been dropped. He was standing in the pit below the basement and the elevator does not descent below the level of the basement. This saved Read from meeting with the same fate as Pond. The machinery of the elevator was started through some unknown agency, and the cage slid down the shaft pinning Pond and crushing his skull. The body was removed to the Morgue, and an inquest will be held. Mr. Pond is survived by a widow and six children.

Orders are short.—It was stated by an official of the Dominion Steel Corporation, Sydney, N.S., that unless new business was booked, the plant would suspend operations next week. To the present the plant has been working on outstanding orders, but no new ones have been received, and the outlook was none too good. Unless these are received or unless the head office in Montreal orders the manufacture of stock to be kept on hand until called for, prospects were for a shutdown at least temporarily next week.



DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED

Engineers • Manufacturers

BRANTFORD, CANADA

Classified Opportunities

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

FLOOR SPACE WANTED

5,000 TO 10,000 SQUARE FEET OF GROUND floor space suitable for Forging and Stamping operations, or will consider purchasing a Forge Shop or Machine Shop, with equipment, about this size. Box 749, Canadian Machinery. (c5m)

MACHINERY WANTED

WANTED—ONE PORTABLE FLOOR CRANE and hoist lift, 7 feet or over. W. G. Utley, Yarmouth, N.S. (c2m)

GEARED POWER PRESS, 4" STROKE OR more.
No. 21 Power Press.
16" or 18" Bulldozer.
Bradley Hammer.
20" Shaper.
16" or 18" Lathe.
20" Drill.
500 to 800 lb. Drop Hammer.
State condition and prices. Box 748, Canadian Machinery. (c5m)

CASTINGS

Medium and light, grey iron castings for manufacturing purposes. We carry bushings, solid and cored, from 1 in. to 6 in., or larger.

TORONTO FOUNDRY CO.
1884 Davenport Road, Toronto
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Grey Iron Castings

Light and Medium Bench and Floor Repetition Castings, Capacity 15 tons per day
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi finishing operations on Lathe or Grill on Castings supplied if required
ASK US
THE KATIE FOUNDRY, GALT, ONT.

PARTIAL LIST

Machine Shop Equipment

At Extremely Low Prices

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long. ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 11½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1 Centrifugal Pump, 2½ in. x 1½ in. Gould
1 Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

Standard Equipment & Tool Works
Dept. K. 307 St. James St.
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(20)

POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic, age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery. (c6m)

FOR SALE

ENCLOSED LIQUID FUEL COMBUSTION APparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented October 8th, 1918. Can be inspected at and for sale by H. W. Petrie, Limited, 131 Front St. W., Toronto.

FOR SALE

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

Used Machinery For Sale

1—24" Smith & Mills Shaper
1—[illegible] Radial Drill
1—36" x 36" x 10' Bertram Planer
2—[illegible]" x 36" Jones & Lamson Turret Lathes
1—[illegible]" x 24" Jones & Lamson Turret Lathe
1—17" x 6' South Bend Lathe
1—18" x 8' Stevens Lathe
2—18" x 8' Mueller Lathe. Q.C.G.
1—18" x 8' Cincinnati Lathe. Q.C.G.
1—26" x 12' C.M.C. Lathe. Q.C.G.
1—26" x 48" x 14' McCabe Double Spindle Lathe.
We are offering the above machines at attractive prices for quick sale

Charles P. Archibald & Co.
Machinery and Supplies
285 Beaver Hall Hill **Montreal**

REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

Carter Welding Co.
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7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
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HELP WANTED

GENERAL MANAGER REQUIRED IMMEDIately for small engineering works in Ontario employing about 100 men and comprising machine shops and grey iron foundry manufacturing machine moulded castings; must be thoroughly experienced in this class of work and competent to take entire charge, including office and sales end of the business; preference given to one having experience in agricultural machinery; good prospect for energetic man; apply, stating age and salary required and give references; applications will be treated in confidence. Box 745, Canadian Machinery. (c4m)

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 783. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

PATTERNS

Wragge's Pattern Works, 10 George St. South, Galt, Ont., Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

MACHINERY FOR SALE

1—24" x 12' Canadian Machinery Lathe
2—22' x 10' Davies Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
3—19" x 8' C.M.C. Lathes.
1—18" x 8' London Lathe.
1—16" x 8' C.M.C. Lathe.
1—16" x 6' McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1 D.C. Compound Wound Generator. 110 Volts, 125 Amp.
2 No. 51 Perkins Sprue Cutters.
2—2" x 26" Pratt & Whitney Turrets.
1 10" x 52" Plain Landis Grinder.

Write us for particulars and prices.

YEATES MACHINERY
LONDON

Hale St., London, Ont.

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MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

TURBO UNITS

25 Cycles

Generator				Turbine.	
K.W.	Volts	R.P.M.	MAKER	K.W.	Pressure
500	400	1500	WESTINGHOUSE-PARSONS	500	150 lbs.
750	380	1500	WESTINGHOUSE-PARSONS	750	
750	440	1500	WESTINGHOUSE	750	
850	380	1500	WESTINGHOUSE-PARSONS	750	150 lbs.
1000	2300	1500	WESTINGHOUSE	750	150 lbs.
1000	550	1500	ALLIS-CHALMERS-RATEAU	1000	
1250	6600	1500	WESTINGHOUSE	1000	140 lbs.
1500	370	1500	GENERAL ELECTRIC-CURTIS	1250	175 lbs.
2500	2400	1500	WESTINGHOUSE	2500	150 lbs.
5000	11000	500	GENERAL ELECTRIC-CURTIS	5000	175 lbs.
6500	6600	750	ALLIS-CHALMERS	6500	175 lbs.

If interested in 60 cycle Turbo Units write for particulars.

MacGOVERN & COMPANY, INC.

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plants: Lincoln, N.J. and Linden, N.J. Buyers and Sellers of New and Used Machinery.

Machinery Agencies Wanted

A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

Woodworking Machinery
Ironworking Machinery
Contractors' Machinery
(Hoists, Mixers, etc.)
Pumps
Electric Motors

Address:

MACHINERY
P.O. Box 847
HALIFAX

Exceptional Offering in Rebuilt High Grade Machinery

1 24″ x 12′ Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
3—24″ x 10′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1—22″ x 10′ Milwaukee, 3 step cone, D.B.G., S.G.C.
1—22″ x 10′ Hamilton, 3 step cone, D.B.G., S.G.C.
1 18″ x 8′ Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
2—18″ x 8′ Mueller, 3 step cone, D.B.G., Q.C.G.
1—17″ x 8′ Sidney, 3 step cone, D.B.G., Q.C.G.
1—14″ x 8′ American, 3 step cone, S.B.G., Q.C.G.

GRINDERS

7—No. 6 Perfect.
1—No. 6 Perfect, with Adj. Guards.
1—No. 1 Champion.
3—No. 10 Perfect.
1—Production Surface Grinder.
1—Ford-Smith 16″ x 2′ Wet Tool Grinder complete.

The above machines have all been overhauled and are in first-class condition and the prices are right.

It is only a partial list of our large stock. What are your requirements? Let us have them. We are interested. All enquiries receive personal attention.

Western representative for The Geo. F. Foss Machinery & Supply Co., Ltd. Montreal, Que.

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Room 37, 33 Richmond Street West
TORONTO - ONT.
Telephone Main 4728

PARTIAL LIST

12″ Pond Car Wheel Lathe, Motor Drive
36″ x 22′ Bridgeford, g. h. Motor Drive.
36 x 16′ Sidney, D. B. G., Q. C., new
27 x 14′ Sidney, D. B. G., Q. C., new
14″ to 21″ x 6′ to 12′ Sidney
13″ to 15″ x 6′ to 12″ Carrol-Jamieson

Large Stock-used Lathes

40 x 40 x 10′ Powell, 2H Planer
24 x 24 x 5′ Pease 1H Planer
16 x 16 x 42″ Walter, 1H Planer
14″ Steptoe Shaper
16″ x 20″ x 24″ Steptoe, B.G., new Shaper
7″ Rhodes, Precision, new Shaper
16″ Used Smith-Mills Shaper
16″ Used Kelley, B. G. Shaper
No. 4 Brown and Sharpe, Plain Miller
No. 24 Osterlein, Plain Miller
No. 22 Garvin, Vertical Miller
No. 2 M. U. Garvin, Universal, new Miller
No. 1 Dow, Plain, new Miller
No. 3 Burk Hand Miller
No. 3½ Fox Hand Miller
6′ Western Universal Radial Drill
3′ Mueller, Plain, Radial Drill
42″ Canedy-Otto Plain, new Drill
3 Spindle Barnes, B.G. Drill
No. 1 Caplin Keyseater
No. 4 Caplin Keyseater
No. 0 Baker Keyseater
10″ x 36″ Norton Plain Grinder

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Canada's Premier Machinery House

TORONTO HAMILTON

SPECIAL TOOLS FOR IMMEDIATE DELIVERY

1—BERTRAM VERTICAL EXTENSION TYPE BORING MILL. Swings 11′ when closed, 20′ when extended. Takes 7′ 6″ under tools. Has 2 heads on rail and auxiliary boring head. Excellent condition.

1—8′ UNIVERSAL RADIAL DRILL. Spindle 4″ dia. with plain box table. Base of "T" pattern 12′ x 4′ 3″. Belt driven. Splendid condition.

2—12′ WALL RADIAL DRILLS. (Countersinking drills.)

1—BERTRAM 6-SPINDLE INDEPENDENT-FEED DRILL. Spindles 2¼″ dia. Feed 13″. Table 12′ 3″ x 24″. Nearly new.

1—1,500-lb. BEMENT DOUBLE FRAME STEAM HAMMER. Complete with operating valve, anvil, etc.

1—30″ x 12″ x 8½′ IRON PLANER. 2 heads on rail. Table 29′ between pockets x 8′ wide. Heavy cored section housings.

1—36″ x 36″ x 12′ BELMER EAMES PLANER. 2 heads on rail. 2 side heads. Excellent condition.

1—BERTRAM DOUBLE END PUNCH AND SHEAR. 42″ throat. Will punch 1½″ in 1⅛″ plate. Shear 8″ x 1″ flat. Excellent condition.

1—EDWARDS DOUBLE END PUNCH AND SHEAR. Punch 38″ throat. Will punch 2″ in 1″ plate. Shear 30″ throat, with splitting shear blades 18″ long. Also angle shear in centre of frame for 6″ x 6″ angles. Splendid condition.

1—CLEVELAND STYLE "C" SINGLE END PUNCH. 24″ throat. Will punch 1″ in ½″ plate. Architectural jaw.

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1—BERTRAM HORIZONTAL PUNCH. Will punch 1″ in 1″ plate. 16½″ gap. Belt driven. Like new.

1—LENNOX ROTARY PLATE BEVELLING SHEAR. Capacity ¾″ plate. Nearly new.

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1—5-TON REVOLVING LOCO CRANE. Standard gauge. Boom 25′ long. Engine 7″ x 10″, double cyl. Truck frame 9′ 6″ x 6′ 6″, on 4 wheels.

1—42″ STYLE "A" WEST SIDE POWER FEED BAND RIP SAW. Table 52″ x 42″. Like new.

1—54″ McDONOUGH HORIZONTAL BAND RESAW, with bevel siding attachment. Has power feed and will take stock up to 30½″ wide x 12″ thick. Takes 7″ saw.

1—No. 640 AMERICAN EIGHT-ROLL "BOSS" TIMBER SIZER. Will surface all four sides on timber up to 30″ x 20″. Has 6 rates of feed. Furnished with forged steel cylinders, chipbreaker, etc. Belt driven.

Many Other Good Tools in Stock—Let Us Know Your Requirements

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1—1 HP., 700 RPM, New
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2—3 HP., 700 RPM, New
7—3 HP., 1400 RPM, New
1—3 HP., 1400 RPM, Used
2—5 HP., 1400 RPM, New.
3—5 HP., 1400 RPM, Used
2—7½ HP., 1400 RPM, New
1—7½ HP., 700 RPM, Used
3—10 HP., 1400 RPM, Used
15 HP., 1400 RPM, New

Wagner

1—1 HP., 1400 RPM, Used
1—3 HP., 700 RPM, New
1—3 HP., 1400 RPM, New

Miscellaneous

3—¼ HP., New Wagner, 25 Cycle, 3 Phase, 220 V., 1420 RPM, A.C.
3—1 HP., New Imperial Electric, 25 Cycle, 3 Phase, 250 Volt, 500 RPM.
1—2 HP., New Imperial Electric, 25 Cycle, 3 Phase, 250 Volt, 500 RPM, D.C.
1—3 HP., New Western Electric, 25 Cycle, 3 Phase, 220 Volt, 1100 RPM, D.C.
75 HP., Used, Crocker Wheeler, 25 Cycle, 3 Phase, 115-230 V., 750 RPM., V.S.

MACHINE TOOLS—BORING MILLS

60" Bullard Boring Mill. Used, but in good working condition.

1—42" Bullard Maximill, with two swivel heads and plain parallel slot table with one set of four XAP-2 Independent Face Plate Jaws with Steel Bodies with Type G Motor Bracket without motor. Used only a short time.

1—60" Gisholm Vertical Boring Mill. Used, but in good condition as when new.

36" Bullard Vertical Turret Lathe. New. Type equipped with three-jaw combination chuck, built-up tools with type F holder brackets, with cutting lubricant system and four KT3 tool holders, complete without motor. New, never used.

LATHES

18" x 8' Niagara Lathe, back geared, complete with countershaft. Used, but in good working condition.

24½" x 6' Ingersoll Lathe, double back geared, complete with countershaft. Used, but in good condition.

20" x 8' Warner Lathe, with taper attachment, complete with countershaft complete.

MILLING MACHINES

No. 4 Cincinnati Milling Machine, complete with standard equipment. New, never used.

DRILL

48" Scott Heavy Duty Radial Drill, complete with standard equipment. Used, but in good working condition.

SAWS

No. 26" Higley Cold Metal Saw. Lever feed, 4" diameter x 16" to 8" thick. Power 2" to 12". Height of table 37". Pulley 16" x 4". Practically new condition.

1—Large Low Cost Saw. Used, but in good condition.

RUBBER MACHINERY

1—66" Mills. New.
1—66" x 12' Horizontal Hose. New.
4—48" William's Vertical Heaters. New.
1—100 Gal. Day Mixer. New.
1—60" Spadone Bias Cutter.
1—66" Birmingham Calender, with 7½ HP. Westinghouse Motor complete. New.
2—500 Gal. Cotton Mixers, complete.

REGULATORS

1—Mason Regulator, 2", 100 lbs. to 40 lbs. New.
1—Mason Regulators, 2", 100 lbs. to 60 lbs. New.
4—Mason Regulators, 1" Type G-C, 200 lbs. to 20 lbs. New.
4—Crane Regulators, No. 962, 1".
25—Crane Regulators, No. 962, 2".

THERMOMETERS

20—New Bristol Recording Thermometers, Model 240, Range 250, each with 24' of bronze armoured conducting tube and chart No. 664. Complete in moisture-proof cases.
20—New Taghabin Straight Stem Thermometers, 200 to 350 deg.
New Taghabin Angle Stem Thermometers, 200 to 350 deg.
New Tycos Straight Stem Thermometers.
4—New Tycos Thermometers, No. 28, 9" Scale. Range 0 to 200C.
5—New Taghabin combined Fahrenheit and pounds steam pressure, 190 to 240 deg.

TRAPS

6—No. 4, Model D, Anderson Steam Traps. Used, but in good order and are in perfect working condition.
4—½" No. 14 I. M. Steam Traps.
1—¾" No. 2 I. M. Steam Trap.
1—1" No. 4 I. M. Steam Trap.
1—1½" No. 7 I. M. Steam Trap.

SCALES

1—National Weighing and Counting Scale. Platform 24" square. 600 lbs. capacity, with multiplex scoops.
1—New Brantford Blue Dial Scale. No. 20 capacity 20 lbs. by 4 ounces.

TANKS

1—Steel Plate Storage Tank, 60" diameter, 25' long, 7,000 gals. capacity, 3/16" plate in shell, ¼" in heads, manhole in middle of shell, 2" outlet on each side of manhole.

Only 50 gal. Bowser Tank with pump and agitator mounted on large rubber-tired wheels. New, never used.

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If you are in the market for any equipment or supplies which does not appear on this list, let us have your enquiry about it. Possibly it has been turned over to us since this bulletin was issued.

Write for list of Engineering and Factory Supplies we have to offer.

REELS

60—Heavy Steel Reels. Diameter of Flanges 50", diameter of Barrel 10", between flanges 20", Barrel 9", weight 130 lbs.

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2,000 lbs. 1¼" Square Machinery
1,000 lbs. 1¾" Round Machinery
1,100 lbs. 1⅝" Round Machinery
4,000 lbs. 1¼ x 2" Machinery
100 lbs. 2⅜" Hexagon C.R.
225 lbs. 1⅞" Hexagon C.R.
1,561 lbs. ⅞" x 4" Oil Hardening Carbon Steel Keys.
326 lbs. 1" x 4" "Ketos" Tool Steel.
385 lbs. 1" x 5" "Ketos" Tool Steel.
237 lbs. 1¾" Square Full-speed Steel.
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27 lbs. 4" Rd. Carbon Tool Steel.
158 lbs. 1¾" Hex. Cast Steel.

Building Materials

NAILS

392 kegs 2½" Flooring Nails.
218 kegs 2½" Common Nails.
46 kegs 2" Corrugated Nails.
253 kegs 1" Cadmium Nails.
1 kegs 6" Common Nails.

PAINT

225 gals. Glidden's Mill White Paint.
225 gals. Glidden's Blue Gloss Paint.
45 gals. Black Radiator Paint.
25 gals. Venetian Red Paint.

LUMBER

495,000 ft. B.M. 2x4 Spruce, D. & S. and 2E. Beveled edges.
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20,000 ft. B.M. ⅞" Pine and Fir, D. 2 S.
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284 Lineal ft. 4¼ x 11 Indiana Limestone White Sills for Steel Sash.

STEEL SASH

1000 Sq. ft. Steel Sash.

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1 Lots 8" C.I. Pipe, including Tees and Elbows.

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150 Railroad Ties, practically new.

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3—6" New Lunkenheimer "Victor" Flanged Gate Valves, F. & D.
4" New Lunkenheimer "Victor" Flanged Gate Valve, F. & D.
2—6" New Lunkenheimer "Victor" Flanged Gate Valves, F. & D., Screwed.
4" New Chapman Ball Bar Hydrant Gate Valves.
2½" Crane New NH Hydraulic Gate Steel Gate Valves, 1512, 965D, Flanged, API, Complete with Flanges.
8" New Chapman Hydraulic Hose Fire Gate Valve.
10" New Chapman Hydraulic Hose Fire Gate Valve.
12" New Homestead Sway Hydraulic Valves, with working pressure Square Head Screwed.
1—Lunkenheimer Ex. Hex. Swg., Check Valve, 300 lbs.
1—8" New Iron Flanged Gate Valve, O.S. & Y.

BEARINGS

2—Chapman Thrust Ball Bearings.
2—3 7/16" Chapman Thrust Ball Bearings.

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50 Lots No. 7 Gr. Metal Grommets, assorted sizes.
9 Lots No. 6 Gr. Metal Grommets, assorted sizes.

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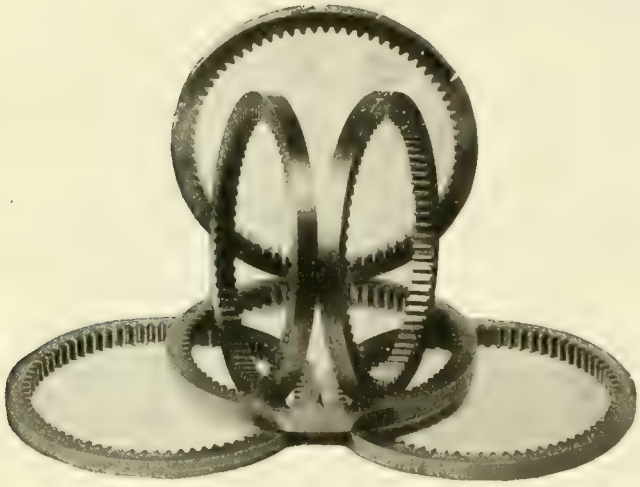

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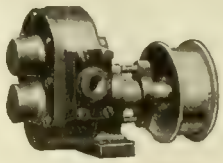

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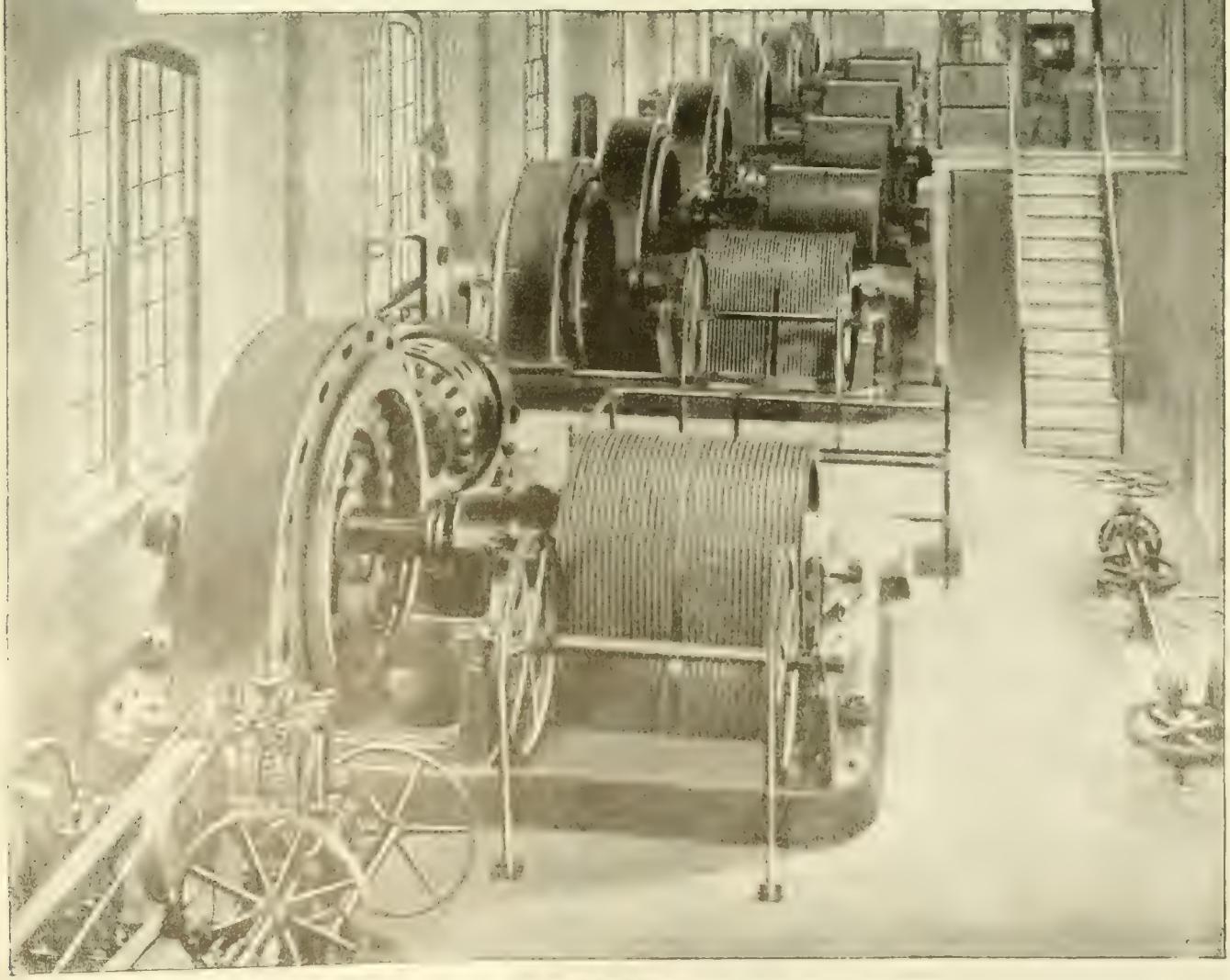

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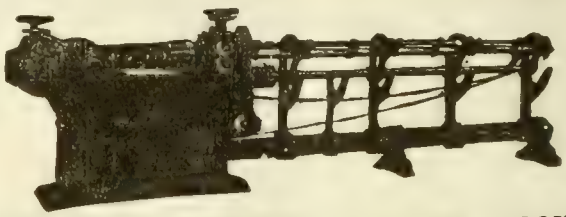

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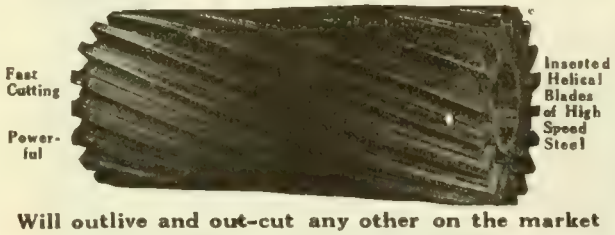

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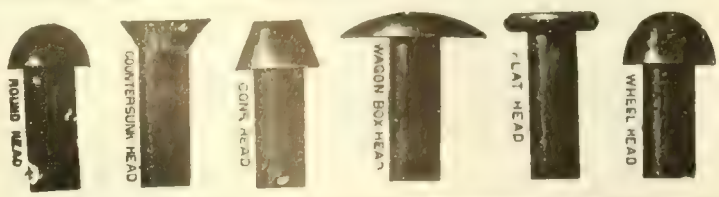

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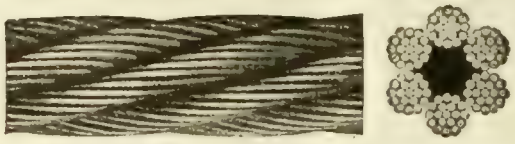

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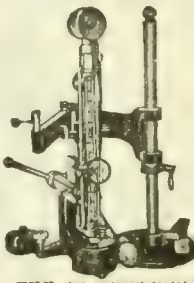

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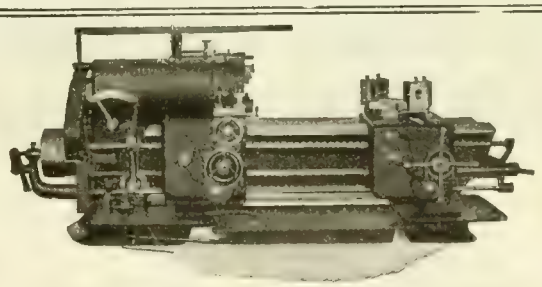

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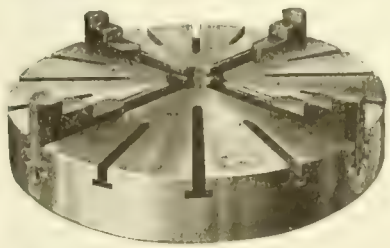

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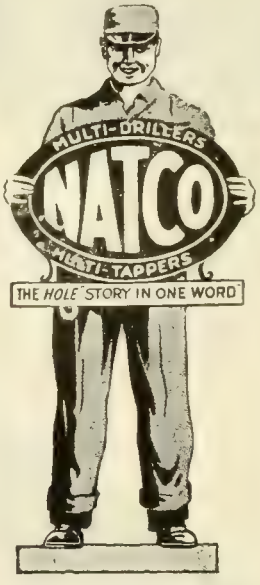

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Castings, Nichrome
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Manitoba Steel Foundries, Ltd., Winnipeg, Man.

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Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
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Skinner Chuck Co., New Britain, Conn.
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Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont
Cushman Chuck Co., Hartford, Conn
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Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
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Gisholt Machine Co., Madison, Wis
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Union Mfg. Co., New Britain, Conn.

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Gisholt Machine Co., Madison, Wis
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Ford-Smith Machine Co., Hamilton, Ont
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Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

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Main Belting Co. of Can., Montreal, Que.
Mahaney Gravity Carrier Co., Port Hope, Ont.

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Cored Bronze Bars
Tallman Brass & Metal Ltd. Hamilton Ont

Cotter Pins
Morrow Screw & Nut Co. Ltd. John Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd. Toronto, Ont
Starrett Co. L. S., Athol, Mass

Countershafts
Bertram & Son Co., Ltd., The John Dundas, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que

Couplings, Flexible
Holden Co., Ltd., Montreal, Que

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont
Underwood Corp., H. B., Philadelphia, Pa

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

Cutters, Milling
Bilton Machine Co., Bridgeport, Conn
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Milling Machine Co., Cleveland
Elliott & Whitehall Tool Co., Galt, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que

Cutting Oil Filters (See Oil Filtering Systems)
Bowser & Co., Inc., S. F., Fort Wayne, I
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton Ont.

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio.

Dies, Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hillier, St. Catharines, Ont.

BUYERS' DIRECTORY

Dies, Self-Opening, Adjustable
Geometric Tool Co., New Haven, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Dividing Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Dickey, Fred C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill

Drafting Boards and Tables
Darling Bros., Ltd., Montreal, Que
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que

Dressers, Grinding Wheel
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England
Can. Blower & Forge Co., Ltd., Kitchener.
Goodell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg. Co., Hartford, Conn.
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Bertram & Son Co., Ltd., The, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont
Gisholt Machine Co., Madison, Wis.
Henry & Wright Mfg. Co., Hartford, Conn.

Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond, Ind
Terry & Co., John C., Birmingham, Eng

Drilling Machines, Pneumatic
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

Drilling Machines, Portable
Haskins Co., R. G., Chicago, Ill
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Riverson & Son, Jos. T., Chicago, Ill
Toomey Inc., Frank, Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Turret
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd Walkerville, Ont

Drills, High Speed Twist
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass

Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada Ltd., Walkerville, Ont.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener
Sturtevant Co., B. F., Boston, Mass

Electrical Instruments
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Cloth
Wausau Abrasives Co., Chicago, Ill.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont.

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

Expanders, Tube
Garlock Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

Fibre
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que.

File Handles
Ingersoll File Co., Ltd., Ingersoll, Ont

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que

Filing Machines
Garlock Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont.

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co., Walkerland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont

Forgings, Hammer
Canada Foundries & Forgings Co., Walkerland, Ont
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que
Mechanical Engineering Co., Three Rivers, Que
Rockwell Co., W. S., New York City

Furnaces, Heat Treating Oil and Gas
Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
General Combustion Co. of Can., Ltd., Montreal, Que
Mechanical Engineering Co., Three Rivers, Que
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop
Garlock Walker Mchy. Co., Toronto, Ont
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

Gages, Dial
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont
Perfect, W. B., San Francisco, Calif
Starrett Co., L. S., Athol, Mass

Gages, Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass

Gages, Recording
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd , John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co , of Canada, Ltd , Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co of Can , Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Elliott & Whitehall Tool Co., Galt, O.
Johansson Inc., C E., Windsor, Ont.

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co of Can , Ltd Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can , Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co of Can , Ltd Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co , Ltd , The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co , Providence, R I

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q
Diamond State Fibre Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Steel Products Co., Brantford, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gardner & Son, Robt., Montreal, Que
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co , Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
Gardner & Son, Robt , Montreal, Que
Morse Chain Co., Ithaca, N.Y.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co , Ltd , Montreal, Que
Northern Electric Co , Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll Rand Co , Ltd , Sherbrooke, Que.
Can Link Belt Co , Toronto, Ont.
Dominion Bridge Co , Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co , Ltd , Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Grinding Machines
Brown & Sharpe Mfg Co., Providence, R I.

Grinding Machines, Abrasive Belt
Beacon Engineering Co , Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd , Toronto, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F , Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co , New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co , of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co , Toronto, Ont.
Waltham Grinding Wheel Co , Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co , Racine, Wis

Grinding Machines Chaser

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock Walker Mchy Co , Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy Co , Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co , of Canada, Ltd , Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co , Springfield, Vermont
Murchey Machine & Tool Co , Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co , Tipton, England
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co Tipton, England
Bertram & Son Co , Ltd , The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford Smith Machine Co , Hamilton, Ont

Grinding Machines, Floor and Tool
Beacon Engineering Co , Tipton, England
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co , Erie, Pa
National Acme Co., Cleveland, Ohio.
Petrie, Ltd , H W , Toronto, Ont
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Norton Co. of Can , Ltd , Hamilton, Ont

Grinding Machines, Surface
Garlock-Walker Mchy Co , Toronto, Ont
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co , of Canada, Ltd , Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co , of Canada, Ltd , Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co , Geo F , Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co , Erie, Pa.
Morse Twist Drill & Machine Co , New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Guards, Machinery and Window
Can Wire & Iron Goods Co., Hamilton, Ont.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd , H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co , Toronto, Ont.

Hammers, Drop
Bertram & Son Co , Ltd , The John Dundas, Ont.
Bliss Co , E W , Brooklyn, N Y
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd , Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos T , Chicago, Ill.

Hammers, Power
Bertram & Son Co , Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

Hammers, Riveting
Cleveland Pneumatic Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T , Chicago, Ill

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd , H. W., Toronto, Ont

Hobs
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, All Kinds
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Flexible
Gutta Percha & Rubber, Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co , Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can , Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can Foamite Firefoam Co , Hamilton, Ont.

Hose, Steam, Suction, Water
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Steel
International Machinery & Supply Co., Montreal, Que

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass.

Hydraulic Machinery
Bertram & Son Co , Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co , Duncan, Glasgow, Scot

Index Centers
Dickow, Fred C , Machinery Co , Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insultion
Diamond State Fibre Co of Can , Ltd Toronto, Ont.

Jacks, Hydraulic
International Machinery & Supply Co., Montreal, Que.
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Jigs and Fixtures (See Tool Work)
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Lassiter & Whitehall Tool Co., Galt, Ont
Garlock Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada Ltd., Dundas, Ont.
Toomey Inc., Frank, Philadelphia, Pa.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Simonds Canada Saw Co., Montreal, Que

Knurl Holders
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis
Hendey Machine Co., Torrington, Conn

Lathes, Automatic and Semi-Automatic
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio
Steinle Turret Machine Co., Madison, Wis

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co. of Canada Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Steinle Turret Machine Co., Madison, Wis

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Pierson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Pierson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Starrett Co., L. S., Athol, Mass.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wahlstrom Lathe Co., Lyons, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis
McDougall Co., Ltd., R., Galt, Ont
Morton Mfg. Co., Grand Rapids, Mich
Queen City Machine Tool Co., Cincinnati, Ohio

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Dominion Engineering Works, Ltd., Montreal

BUYERS' DIRECTORY

Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathe, Speed and Hand
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Loomis Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cataract Refining Co., Toronto, Ont
Oakley Chemical Co., New York, N.Y

Lubricating Systems
Bowser & Co., Inc., S. F., Fort Wayne, I

Machinists' Small Tools
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Ker & Goodwin Machine Co., Brantford, Ont
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Pierson & Son, Jos. T., Chicago, Ill
Starrett Co., L. S., Athol, Mass.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal Que

Mandrels, Expanding
Pratt & Whitney Co., of Canada Ltd., Dundas, Ont

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

Metals, Alloy
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
Toomey Inc., Frank, Philadelphia, Pa

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser & Co., Inc., S. F., Fort Wayne, I.

Oil Storage Engineers
Bowser & Co., Inc., S. F., Fort Wayne, I.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Stones
Carborundum Co., Niagara Falls, N.Y.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont
International Machinery & Supply Co., Montreal, Que.

Packing, Rod and Steam
Quaker City Rubber Co., Philadelphia, Pa

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland

Patents
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Cutting and Threading Machines
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa

Piston-Ring Machines
National Automatic Tool Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q
Brown & Sharpe Mfg. Co., Providence, R.I.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Hart & Co., Duncan, Glasgow, Scot
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng

Rules, Steel and Wood
Brown & Sharpe Mfg Co., Providence, R.I.

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Paper
Wausau Abrasives Co., Chicago, Ill.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont

Sand Mills
Frost Mfg Co., Chicago, Ill.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven Mich

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Simonds Canada Saw Co., Montreal, Que

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que
Ryerson & Son, Jos. T., Chicago, Ill.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

BUYERS' DIRECTORY

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn
Asa S., Hartford, Conn
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton Ont

Screw Machinery, Wood and Lag
Asa S., Hartford, Conn

Screw Machines
& Sharpe Mfg. Co., Providence, R.I

Screw Machines, Automatic
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont

Separators, Moisture and Oil
Bowser & Co., Inc., S. F., Fort Wayne, I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser & Co., Inc., S. F., Fort Wayne, I

Shafting
Canada Foundries & Forgings Co., Welland, Ont
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont
Roelefson Machine & Tool Co., Toronto, Ont
Smith & Mills Co., Cincinnati, Ohio
Toomey Inc., Frank, Philadelphia, Pa.
Walcott Lathe Co., Jackson, Mich
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stott & Co., Duncan, Glasgow, Scot
Toronto, Ont

Shearing Machines, Angle, Iron Bar and Gate

Sheet Metal Working Machinery

Sheets, Nickel Resist. Alloy

Sheets, Vulcan Fibre

Side Frames, Locomotive

Slotting Attachments

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont
Fort Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Solders
British Smelting & Refining Co., Ltd., Montreal, Que

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont
Union Drawn Steel Co., Hamilton, Ont

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Tagge Wells, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canada Steel Co., Ltd.
Montreal, Que.
Steel Foundry Co., Pa.

Steels, Alloy, Open Hearth and Electric

Steels, Alloy and Carbon
Montreal, Que.

Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont
United Alloy Steel Corp., Canton, Ohio
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que

Stools, Shop
Ministry of Munitions, London, Eng

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.
Ryerson & Son, Jos. T., Chicago, Ill.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.
Can. John Wood Mfg. Co., Ltd., Toronto, Ont

Tanks and Pumps, Oil
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Toronto Iron Works, Toronto, Ont.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John Ingersoll Ont
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng
Starrett Co., L. S., Athol Mass

Tapping Machines and Attachments
Archibald & Co., Chas. P., Montreal, Q.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Greenfield Tap & Die Corp., Galt, Ont.
Geometric Tool Co., New Haven, Conn.
International Machine & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Toronto, Ont.

Taps, Collapsing
Landis & Co., A. L., Waynesboro, Pa.
Montreal & Toronto, Ont.
Acme Co., Cleveland, O.
Worcester, Mass.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threading Machines
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que
Chesterman & Co., Ltd., J., Sheffield, Eng.
Elliott & Whitehall Tool Co., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven Conn.
Greenfield Tap & Die Corp., Galt, Ont
Hamilton Engineering Service, Ltd., Hamilton, Ont
Keller Pneumatic Tool Co., Grand Haven, Mich
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow
International Machinery & Supply Co., Montreal, Que.

Trackwork, Railway

Trackwork, Manganese Steel

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Positive Clutch & Pulley Works, Toronto, Ont.

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Mathews Gravity Carrier Co., Port Hope, Ont

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Can Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa

Trolleys and Tramways
Can Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg Co., Lisbon, Ohio.

Trucks
Can Fairbanks Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto, Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont

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Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
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Tubing, Seamless Steel, Brass and Copper and Fibre
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Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

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Tubing, Welded Steel
Tube Co of Canada, Toronto, Ont.

Turbines, Water
Kennedy & Sons, Wm Owen Sound, Ont

Turret Heads
Ackworthine, Ltd Ltd Birmingham, Eng
Bertram & Son Co Ltd, The John, Dundas, Ont

Turret Machines (See Lathes, Horizontal Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.

Unions, Pipe
Crane Ltd., Montreal, Que.

Universal Joints
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Holden Co., Ltd., Montreal, Que.

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Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.

Valves, Rubber Pump
Quaker City Rubber Co., Philadelphia, Pa.

Vises, Drilling Machine
Hoosier Drilling Mach Co., Goshen, Ind
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe Division, Cleveland, O

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R.I
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
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Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

Vises, Wood Workers'
Columbia Hdwe Division, Cleveland, O
Doss Machinery & Supply Co Can Ltd., Montreal Que
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont

Washers, Rubber
Canada Metal Co., Ltd., Sherbrooke Que

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont

Welding, Electric
Carter Welding Co., Toronto, Ont
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont

Voltmeters
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que

Wagon Loaders
Can Link Belt Co., Toronto, Ont

Washers
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Diamond State Fibre Co, Toronto, Ont
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal Que

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Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene
Davis Bournonville Co Jersey City, N J
Hendey Co., Ltd., Montreal, Que
L'Air Liquide Society, Toronto, Ont
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co of Can., Toronto, Ont

Welding, Oxy-Acetylene
Carter Welding Co., Toronto, Ont
Davis-Bournonville Co., Jersey City, N J
Hendey Co., Ltd., Montreal, Que
Lincoln Electric Co., Toronto, Ont
National Electro Products, Toronto, Ont
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill
Union Carbide Co. of Can., Welland, Ont.

Welding Rod, Tobin, Manganese Bronze and Aluminum
Tallman Brass & Metal Ltd., Hamilton, Ont.

Welding Supplies
Canada Smelting & Refining Co., Ltd Montreal, Que.
Carter Welding Co., Toronto, Ont
Davis-Bournonville Co., Jersey City, N J
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co of Canada, Ltd., Toronto, Ont

Wheels, Industrial
American Pulley Co., Philadelphia, Pa
Hull Iron & Steel Foundries, Hull Que
Kennedy & Sons, Wm., Owen Sound, Ont

Winches, Electric
Volta Mfg Co Welland, Ont

Winches, Headgate
Kennedy & Sons, Wm Owen Sound, Ont

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont.

Wire
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Canada Metal Co., Ltd., Toronto, Ont
Dennis Wire & Iron Works, London, Ont
Greening Wire Co B Hamilton, Ont
Northern Electric Co Montreal Que

Wire Cloth
Can Wire & Iron Goods Co., Hamilton Ont.

Wire Rope
Can Wire & Iron Goods Co., Hamilton Ont

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Brown Boggs & Co Ltd, Hamilton, Ont
Schuster Co F B New Haven, Conn

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Perdue W B San Francisco, Calif
Prest-O-Lite Co of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special
Dennis Wire & Iron Works, London, Ont
Greening Wire Co B Hamilton, Ont
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

Woodworking Machinery
Canada Machinery Corp., Galt, Ont
Garlock Walker Mchy Co., Toronto, Ont
Oliver Machinery Co Grand Rapids, Mich
Williams Machinery Co A R Toronto, Ont.

Wrenches, Drop Forged
Armstrong Bros Tool Co., Chicago Ill
Canada Foundries & Forgings Co., Welland, Ont

Wrenches, Machinists'
Armstrong Bros Tool Co., Chicago Ill
Canada Foundries & Forgings Co., Welland, Ont

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
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Wrenches, Tap
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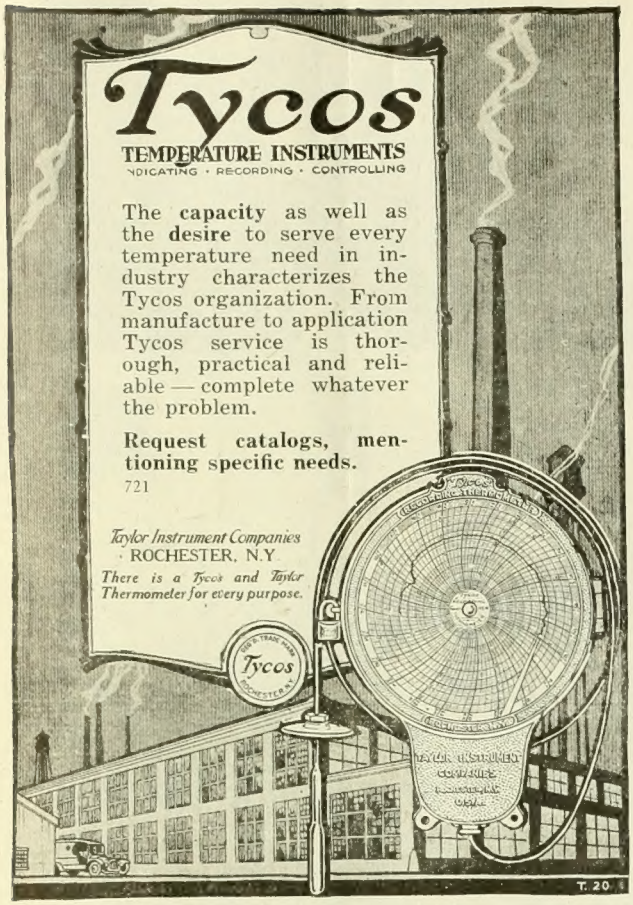
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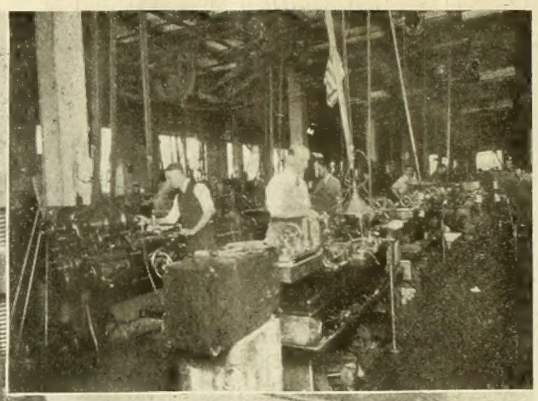

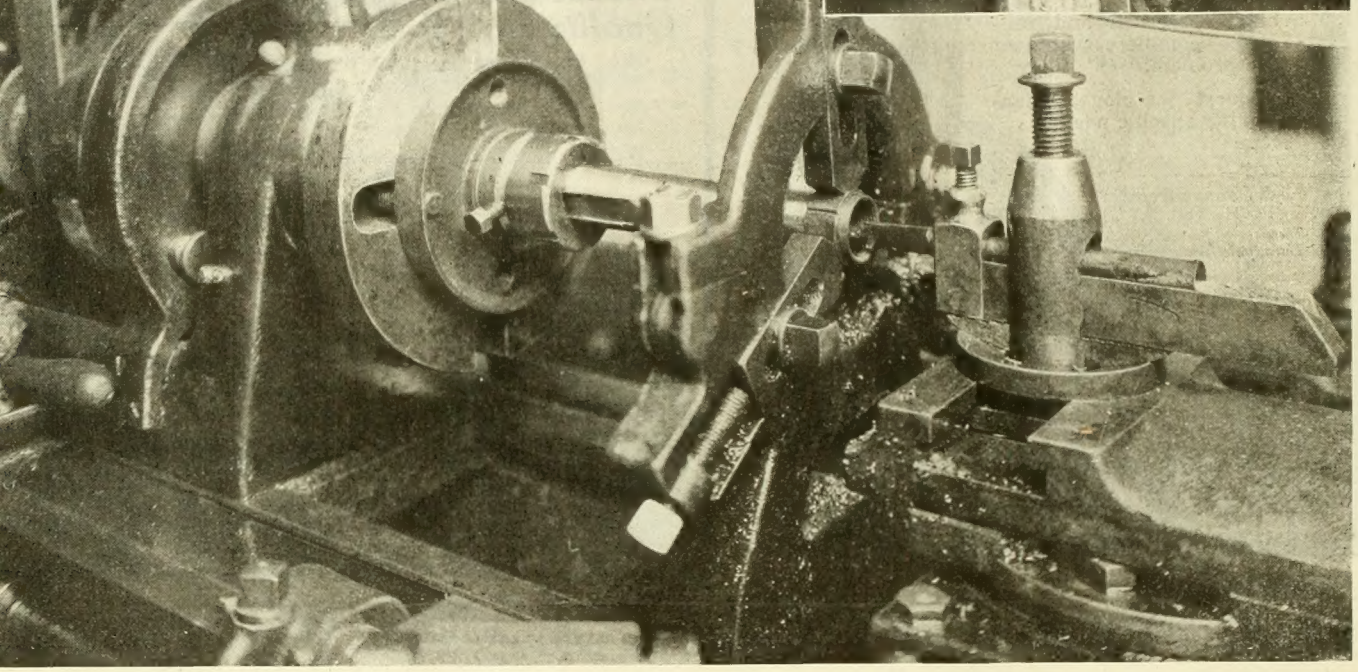

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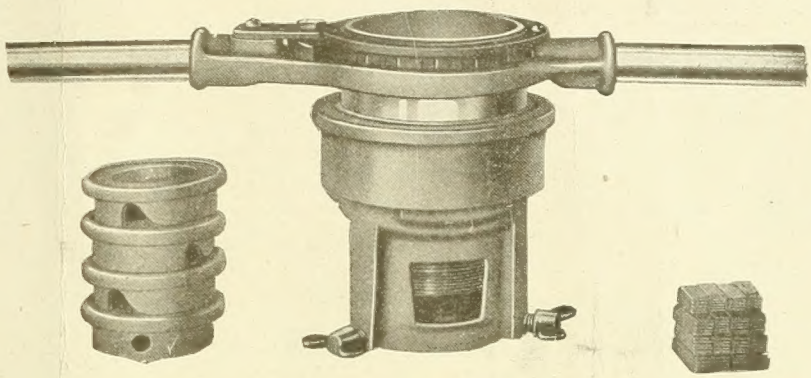

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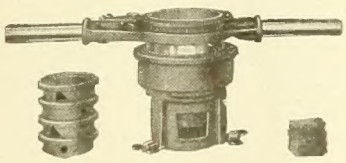

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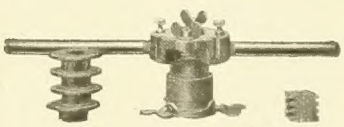

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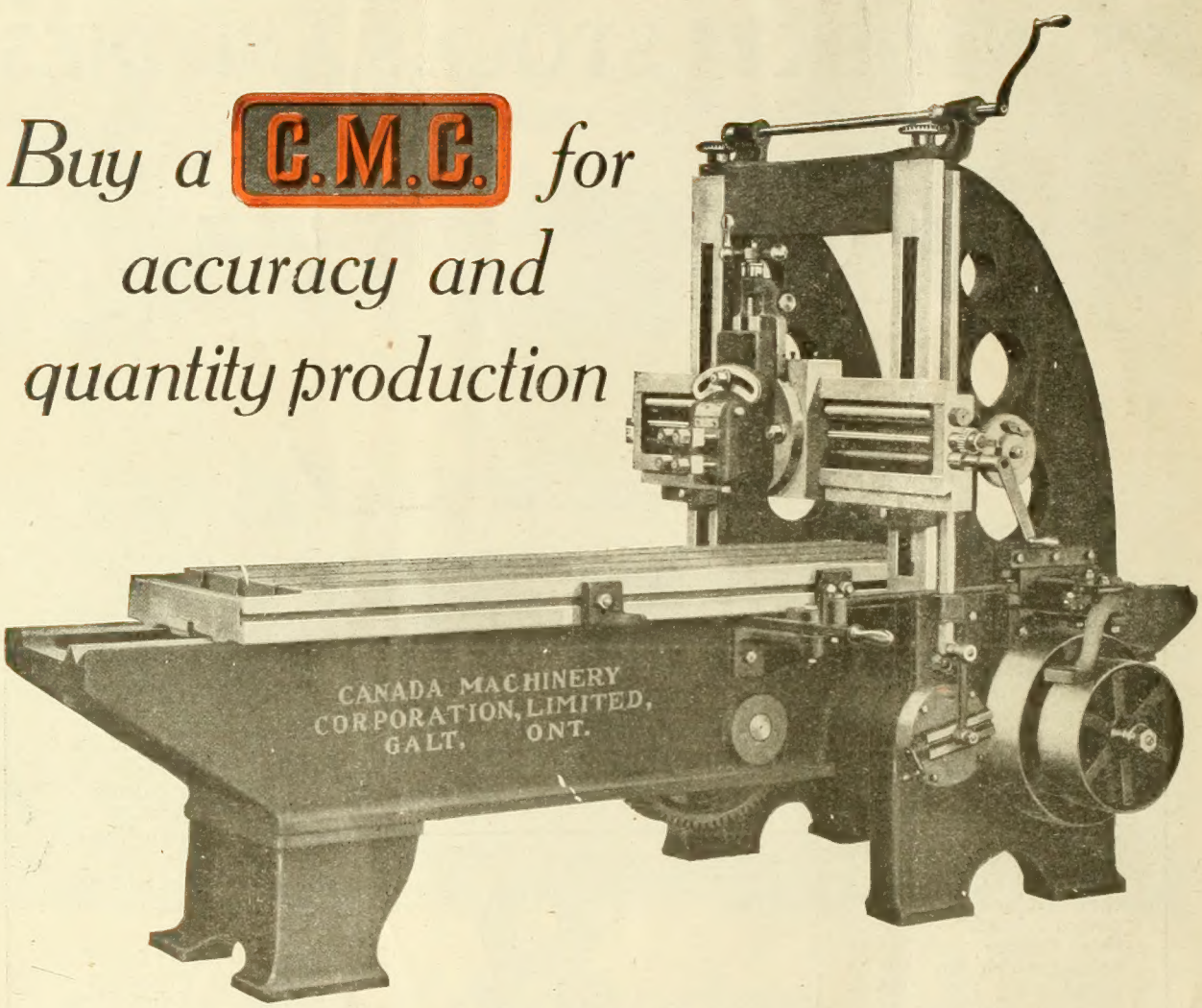

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